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VOL. 34. Ser. A. Part 2. pp. 33-64. FEBRUARY, 1946.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES A: AGRICULTURAL.

ISSUED BY THE COMMONWEALTH INSTITUTE OF ENTOMOLOGY.

C·A·B

LONDON:
COMMONWEALTH INSTITUTE OF ENTOMOLOGY,
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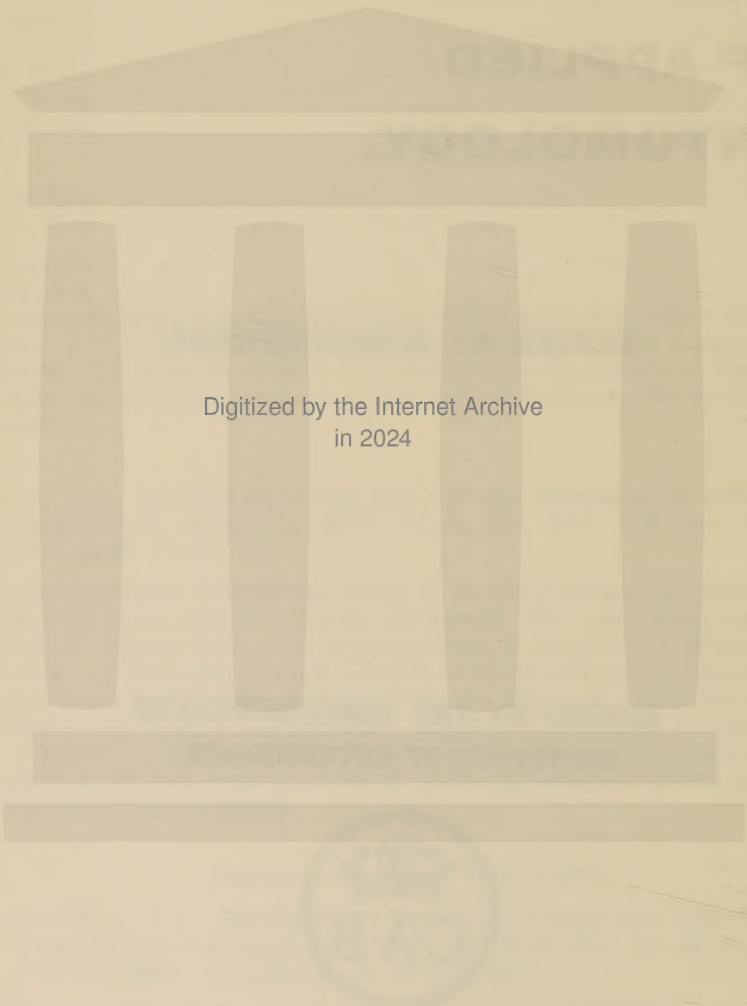

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PINHEY (E. C. G.). **Orthezia Bug.**—*Rhod. agric. J.* **42** no. 1 pp. 24–30, 1 pl. Salisbury, S. Rhod., 1945.

Orthezia insignis, Dgl., the adults and distribution of which are briefly described, was first recorded in Southern Rhodesia in 1929, on *Coleus*, *Gardenia* and *Tecoma* at Umtali, where the climate is warm and moist. It spread considerably from 1937 onwards, and outbreaks were occasionally recorded in other parts of the Colony, in which it is probably fairly widespread. There are many overlapping generations throughout the year, the adult females survive for six or seven weeks, and development lasts at least nine weeks, though it may be retarded in mid-winter, when the weather is cold and dry. Males are rare, and reproduction is chiefly parthenogenetic. Dispersal takes place by wind and water, on the feet of birds and mammals, the bodies of invertebrates and clothing, and also by means of infested plants; there appears to be no actual migration from plant to plant, though both adults and young are active. Lists are given of 23 plants, mostly ornamentals, that are attacked in Southern Rhodesia [*cf. R.A.E.*, A **31** 86] and a further 29 on which the Coccid has been recorded in other countries. *Lantana*, which is frequently cultivated but is also spreading rapidly as a weed, is the most important food-plant and source of infestation in the eastern districts. It occurs throughout the Umtali district in two forms, one of which, with dark foliage, appears to be preferred to the other, which has lighter leaves.

Control is difficult owing to the resistance of the Coccid to insecticides, its wide range of food-plants and ability to exist on their roots, and, near Umtali, the extensive growth of *Lantana*. Fumigation with hydrocyanic acid gas is the most effective measure, though suitable only for small numbers of plants that can be treated in a fumigation chamber. Where sprays of miscible oil or oil emulsions are used, they should be applied at intervals of two or three weeks; heavily-infested trees should first be pruned, the prunings promptly burned, and the ground sprayed before or after their removal. Large numbers of dead Coccids have been observed on unsprayed plants on which the growth of sooty mould was very dense. Death was most probably due to starvation following the checking of the sap stream by the growth of the fungus, but may have been brought about by suffocation or some other direct effect of the fungus. The use of adhesive bands is suggested as a supplementary measure to prevent the Coccids and the ants that tend them from ascending the trees. The control of infestation on *Lantana* by burning has proved effective for small areas or single plants, but it is not effective against Coccids on the roots unless the plants are first uprooted. Other suggested methods of destroying this food-plant include the introduction of *Teleonemia scrupulosa*, Stål, which has given good control in northern Queensland [*cf.* **30** 155], where the climate is also warm and moist.

MORQUER (R.) & NYSTERAKIS (F.). **Le *Fusarium lateritium*, champignon parasite du *Phylloxera vitifolii*.**—*C. R. Soc. Biol.* **138** no. 3–4 pp. 75–76. Paris, 1944.

In July 1940, gallicolae of *Phylloxera vitifoliae*, Fitch, on leaves of Riparia vines at Monlon in south-western France were observed to be dying. Hyphae were isolated aseptically from insects that had died recently and from living ones in galls and were cultured. The fungus, which was identified as *Fusarium lateritium*, is described and its status is discussed. It appears that the leaves are its natural substratum and that it passes from a saprophytic to a parasitic state when the spores contaminate the galls. Spraying a water suspension of conidia on to gall-bearing vine leaves resulted in 40 per cent. mortality of the young and adult Aphids, and 60 per cent. mortality was observed in a natural infestation.

CARAYON (J.). **Les nuages de criquets migrateurs en Gironde pendant l'été 1945.**—*La Nature* no. 3099 pp. 324–325, 1 fig., 1 ref. Paris, 1945.

Flying swarms of *Locusta migratoria*, L., were observed in the region of Bordeaux in the summer of 1945, after three years of exceptional drought. The hoppers hatched towards the end of April and fed on wild grasses, and were found to be close to phase *gregaria*. The adults appeared in July, and flying swarms caused damage to crops. The first eggs were laid at the edge of Lake Laçanau in late August, and the last swarm was seen in September. If climatic conditions continue favourable, it is feared that a more serious outbreak may occur in 1946 unless suitable control measures are adopted.

SHAW (H.). **Field Trials of Dichloro-diphenyl-trichloroethane (D.D.T.) against the Raspberry Beetle** (*Byturus tomentosus* **Fabr.).**—*J. Pomol.* **21** no. 1–4 pp. 140–145, 8 refs. London, 1945.

An account is given of trials made at East Malling, Kent, in 1943 and 1944, to determine whether αα-bis (*p*-chlorphenyl)-βββ-trichlorethane (DDT) could be substituted for rotenone in sprays for the control of *Byturus urbanus*, Lind. (*tomentosus*, auct.) [*cf. R.A.E.*, A **21** 294]. The trials were made on 36 plots of loganberries in six groups of six plots each, each plot containing five plants. Five spray treatments were applied to each group each year, one plot in each being left as a control. The sprays were 0·025 and 0·05 per cent. DDT (about 75 per cent. pure) with 0·05 per cent. Agral 2 and 0·025 per cent. sulphite lye; 0·025 and 0·05 per cent. DDT as dilutions of a 5 per cent. proprietary preparation; and 0·2 per cent. ground *Lonchocarpus* root, equivalent to about 0·011 per cent. rotenone, with 0·05 per cent. Agral 2. The proprietary preparation used in the first year, which had a base of chalk and bentonite and an alkyl naphthalene sulphonate wetter, was unsatisfactory in that it settled out from suspension very rapidly. The one used in the second year, which had a base of china clay with some bentonite and contained an alkyl naphthalene sulphonate and a dinaphthylmethane sulphonate as auxiliaries, was more satisfactory on physical grounds but left a deposit on the fruit that made the earliest batches gathered unfit for sale. Possible means of overcoming this disadvantage are suggested.

One application of each spray was made in 1943 on 15th June and two applications in 1944 on 16th and 30th June [*cf. loc. cit.*]. About ½ gal. was used per plant at each application. In 1943, oviposition was in progress by 7th June, and larvae had entered some fruits by 18th. In 1944, adults were abundant intermittently from 24th May onwards but eggs were difficult to find; there were half-grown larvae in the plugs of the fruits on 4th July. The percentages of infested fruits at each sample picking and in the total crop for all treatments and in both seasons are shown in tables. There was no significant difference in effectiveness between any of the products or concentrations, but the control given by all was highly significant. DDT compared favourably with *Lonchocarpus* both in degree of control obtained and persistence of effect. The single treatment in 1943 did not give adequate control of a fairly heavy infestation (25·9–30·9 per cent. infested fruit in treated plots over the whole season as against 58·8 per cent. in untreated ones), but rain soon after spraying may have contributed to the partial failure. The two applications in 1944 gave excellent control of a lighter infestation, irrespective of the spray used (1·9–3·1 per cent. infested fruit in sprayed plots and 19·2 per cent. in unsprayed). None of the treatments damaged the plants.

WILSON (G. F.). **The Leopard Moth.**—*J. R. hort. Soc.* **70** pt. 5 pp. 148–150, 2 pls. London, 1945.

In view of the increasing importance of *Zeuzera pyrina*, L., among the minor pests of orchard trees in England [*cf. R.A.E.*, A **25** 665], where it has been

recorded from 20 countries within the past 12 years and is most abundant in the south and south-east, an account is given of its bionomics and control, together with descriptions of the egg, larva and adult, and of the damage caused by the larvae. Lists are given of 36 plants, chiefly fruit and forest trees, from which it has been recorded in England ; the fruit trees and bushes are apple, pear, plum, quince, cherry, black currant and gooseberry, of which apple is preferred. Infested trees are distinguished by the wilting and yellowing of leaves on infested branches during the growing season, and the presence of broken or hanging shoots and of frass mingled with powdered wood on the lower branches or the ground beneath the trees. The adults occur from June to September and are most active during June and July. Eggs are laid singly or in groups of 3–4 in cracks in the branches, beneath loose bark, in wounds and round the spurs of apple trees ; as many as 400–500 have been found in a gravid female. The newly-hatched larvae wander for a time, and then enter and feed in the upper twigs, moving to larger branches as they develop. The damage caused by the young larvae to the twigs and spurs of apple closely resembles that due to *Scolytus rugulosus*, Ratz. The tunnelling of the larvae, which make galleries 8–12 ins. in length, weakens the branches and renders them liable to break in windy weather. The duration of the larval stage is dependent on temperature and varies from ten months to two or three years ; feeding may cease when temperature is low during the winter. When fully fed, the larva pupates in a cocoon of silk, in which is incorporated powdered wood, constructed immediately below the bark near the opening of the gallery. Young trees and those with little sap are preferred, and poor soil conditions increase the liability of forest trees to attack. The only natural enemy observed was the green woodpecker [*Gecinus viridis*], which preyed on the larvae.

Control measures comprise removing and burning infested branches, or, where this is undesirable, placing crystals of paradichlorbenzene or cotton-wool soaked in carbon bisulphide within the gallery and sealing the entrance. The larvae can sometimes be killed by means of a flexible wire inserted into the gallery.

The Effect of inert Dusts on the Hide Beetle.—*Bull. imp. Inst.* **43** no. 1 pp. 19–20. London, 1945.

In recent experiments by J. A. Kitchener and J. R. Furlong, *Dermestes maculatus*, Deg. (*vulpinus*, F.) proved very resistant to desiccation by inert dusts that have been found highly effective against insect pests of stored grain [*cf. R.A.E.*, A **32** 38–40], though a small adverse effect on both larvae and adults was obtained in a dry atmosphere. In tests at 26°C. [78·8°F.] and relative humidities of 50 and 90 per cent., in which pieces of hide infested with larvae were dusted on the hairy side and folded with the hairy side inwards, there was no appreciable mortality, but the dusted side remained free from noticeable damage. The untreated side and both sides of the controls were attacked.

[Gilyarov (M. S.).] **Гиляров (М. С.). A new and dangerous Insect Pest of the Seeds of Kok-saghyz and Krym-saghyz.** [*In Ukrainian.*]—*Dopov. Akad. Nauk URSR* 1945 no. 1–2 pp. 47–55, 6 refs. Kiev, 1945. (With Summaries in Russian and English.)

An outbreak of *Nysius ericae*, Schill., occurred in the Provinces of Ivanov and Moscow in 1940 on kok-saghyz [*Taraxacum kok-saghyz*] in second-year plantations, the peak being reached about the middle of July. The adults of

this Lygaeid, which in the Russian Union is apparently restricted to Compositae, hibernate under the fallen leaves of kok-saghyz and oviposit in the flower heads. They shelter during the night and part of the day under the leaves or in cracks in the soil, and crawl up the plants on warm fine days and feed on flower heads in various stages of development.

A survey in July 1940 showed that the bugs were most numerous on wild Compositae and on second-year kok-saghyz and krym-saghyz (*T. megalorrhizon*), less common on first-year plantations of these and rare on flax, hemp, oats, rye, lucerne and lupins. Owing to cold weather in the winter and the early summer of 1941, they were considerably less abundant in that year. The nymphs were first observed on kok-saghyz in the middle of March, and adults survived in insectaries for over a month. Females collected in July contained 15–20 mature eggs each. The infested flower heads of kok-saghyz ceased to develop and the seeds turned black and shrivelled. As the number of bugs per 50 strokes of the net rose from 20 to 228, the percentage germination of the seeds dropped from 93 to 51 and the weight of 1,000 seeds from 0·49 to 0·27 gm. In experiments, the flower heads of krym-saghyz were successfully protected from infestation by nets, whereas the percentage germination of seeds from unprotected plants dropped to one-tenth of the normal. The control measures recommended are deep ploughing of kok-saghyz fields after harvest to destroy the hibernating adults and the destruction of wild Compositae, from which the bug migrates to the plantations.

SVÄRDSON (G.). **Studier och försök rörande vetemyggorna :** *Contarinia tritici* **Kirby och** *Clinodiplosis mosellana* **Géh., samt deras bekämpande. VII. Vetemyggornas vindspridning.** [Studies and Experiments on the Wheat Gall-midges, *Contarinia tritici* and *Sitodiplosis mosellana*, and their Control. VII. Dispersal of the Wheat Gall-midges by Wind.]—*Medd. Växtskyddsanst.* no. 31, 36 pp., 16 figs., 23 refs. Stockholm, 1940. (With a Summary in German.)

The following is based largely on the author's summary. Observations on the manner in which infestation by the wheat gall-midges, *Contarinia tritici*, Kby., and *Sitodiplosis* (*Clinodiplosis*) *mosellana*, Géh., is spread were carried out at Svalöf and several other places in south-western Sweden from 1932 to 1938. As wheat is generally followed there by either grass or beet, and these Cecidomyiids overwinter as full-fed larvae in the soil, the females that emerge in spring have to seek fresh wheat fields for oviposition. Their capacity for flight is not great and they are largely dependent on the wind for carriage. Information was therefore sought by means of traps suspended at heights of some 1½–50 ft. above wheat fields and emergence cages, and the results are shown in tables and discussed with respect to weather conditions. The data given are mainly for *C. tritici*, which is much the commoner species, but the conclusions apply equally to *S. mosellana*, which behaves similarly. It was found that there was some local variation in the date of maximum emergence and that this became progressively later to the east and north of Svalöf and earlier to the south and west. Midges were frequently taken over the experimental fields before they emerged in the local cages, and this occurred most frequently when a south-westerly wind prevailed. The numbers taken in the traps at the various heights varied considerably. They were greatest at the lower levels in relatively calm weather, and at the higher ones during periods of strong southerly winds before local emergence had occurred, and of northerly or east winds after it. The distances covered by the midges were not ascertained, but the presence in the immediate neighbourhood of fields from which adults were emerging appeared to have little effect on the catches even on days on which the wind was from that quarter.

AHLBERG (O.). **Besprutningsförsök mot plommonstekeln,** *Hoplocampa minuta* **Chr.** [Experiments with Sprays against the Plum Sawfly, *H. minuta*.]—*Medd. Växtskyddsanst.* no. 32, 24 pp., 8 figs., 33 refs. Stockholm, 1940. (With a Summary in German.)

Of the species of *Hoplocampa* that infest plum in Sweden, *H. minuta*, Christ, is common in the central and southern part of the country and causes considerable losses, while *H. flava*, L., is restricted to the extreme south and is of little economic importance [*cf. R.A.E.*, A **23** 626]. The life-history and egg, larva and adult of *H. minuta* are briefly described, and an account is given of numerous experiments in 1931–39 on its control. Of the various sprays tested against the larvae, by far the best was a 3 per cent. extract of quassia, which also appeared to have some toxic effect on the eggs. It is prepared by soaking 3 lb. quassia chips in 1½–2 gals. cold water for a day, straining off the chips and boiling them up in a similar amount of fresh water, again straining off the chips and allowing them to drain into the water, mixing the two extracts together and making up to 10 gals.; 0·5–0·75 per cent. common soap is added immediately before use. Two applications, one immediately before full bloom and the other at petal-fall, gave the best results, but the first can be omitted if economy is desired. Since treatment leads to a reduction in population the following year, it may in some cases be advisable to apply three sprays in the first year, the third 8–10 days after the second. Spraying should be supplemented by jarring the trees in the early morning and destroying the adults so obtained and by collecting and destroying infested fruitlets.

Good control was also given by sprays of 0·2–0·3 per cent. nicotine, but lead arsenate, oil emulsions and preparations of pyrethrum and derris were ineffective.

SAALAS (U.). **Bambujäärän,** *Chlorophorus annularis* **F. (Col., Cerambycidae), toukkia Helsingissä suksisauvoja turmelemassa.** [Larvae of *C. annularis* destroying Ski Sticks of Bamboo in Helsinki.]—*Ann. ent. fenn.* **6** no. 4 pp. 112–115, 1 fig., 2 refs. Helsinki, 1941. (With a Summary in English.)

Some half dozen ski sticks of bamboo imported from Japan and purchased in Helsinki in 1935 broke early in 1936. On examination, they were found to contain living larvae of the Cerambycid, *Chlorophorus annularis*, F., which is widely distributed in southern and eastern Asia and was responsible for the breakages.

HUKKINEN (Y.) & SYRJÄNEN (V.). **Beiträge zur Kenntnis der Thysanopteren Finnlands.** [Contributions to Knowledge of the Thysanoptera of Finland.]—*Ann. ent. fenn.* **6** no. 4 pp. 115–128. Helsinki, 1941.

This paper includes a section on thrips of economic importance in Finland in which Hukkinen states that *Frankliniella intonsa*, Tryb., caused considerable damage there by feeding on the tender leaves of young apple trees in a nursery in 1939, and Syrjänen records the occurrence of *Taeniothrips atratus*, Hal., on the flowers of dwarf beans and of *Thrips angusticeps*, Uzel, on lettuce, both in 1936. *T. angusticeps* has not hitherto been known to cause economic damage in Finland. Observations showed that it has only one generation a year. The egg and nymphal stages last about two days and a fortnight, respectively, and the nymphs enter the soil to pupate in July and August. The adults emerge about a week later but remain in the soil to overwinter. Brief descriptions are given of all the immature stages. A few nymphs of *Aeolothrips fasciatus*, L., also occurred on the infested leaves, and it is thought that these may have been predacious on those of *T. angusticeps*.

KANGAS (E.) & LOVÁSZY (P.). **Zur Biologie und forstlichen Bedeutung von *Callimome azureum* Boh. (Hym., Chalcididae).** [The Biology and Importance in Forests of *Torymus azureus*.]—*Ann. ent. fenn.* **6** no. 4 pp. 140–154, 9 figs., 14 refs. Helsinki, 1941.

In view of serious reductions in the yield of spruce seed in Finland in 1937, owing to infestation by insects, and the common occurrence of *Torymus* (*Callimome*) *azureus*, Boh., in material bred from the cones, investigations were carried out in that year and in 1940 on the habits of this Torymid, which has been recorded diversely as feeding on the seeds of spruce [*cf. R.A.E.*, A **6** 91–92] and as parasitic on insects [*cf.* **9** 608 ; **23** 519]. It was found to be parasitic in the galls of the Cecidomyiid, *Dasyneura* (*Perrisia*) *strobi*, Winn., which is itself not a serious pest as it does not attack the seeds. Subsequent examination of the material showed that in addition to *T. azureus*, *T.* (*C.*) *caudatus*, Boh., was also represented ; it is thought to have been parasitic on *Plemeliella abietina*, Seitner, which was also reared from the cones in 1937 [*cf.* **9** 608]. Differences between the larva of *T. azureus*, which is described, and that of *T. caudatus*, based on the material obtained and published descriptions, are discussed.

LOVÁSZY (P.). **Fliegenlarven als Zapfenschädlinge. Vorläufige Mitteilung.** [Fly Larvae as Cone Pests. Preliminary Communication.]—*Ann. ent. fenn.* **8** no. 1 pp. 79–83, 5 figs., 5 refs. Helsinki, 1942.

Dipterous larvae found attacking the immature seeds in young cones of larch (*Larix sibirica*) and spruce (*Picea abies* (*excelsa*)) in southern Finland in the summer of 1940 were provisionally identified as *Hylemyia* (*Chortophila*) *laricicola*, Karl, and *H. anthracina*, Czerny, respectively. Both attack healthy cones, and a single individual destroys several seeds before becoming full-fed ; 2–3 larvae commonly occur in one cone, and infestation causes considerable deformation of the cones and exudation of resin, as well as loss of seed. Larvae of *H. laricicola* were parasitised by *Ephialtes* (*Epiurus*) sp. and *Eurytoma* sp. and those of *H. anthracina* by an unidentified Cynipid.

VAPPULA (N. A.). **Einige in Finnland neue Schädlinge der Gemüsepflanzen und Wurzelgewächse.** [Some new Pests of Vegetables and Root Crops in Finland.]—*Ann. ent. fenn.* **6** no. 4 pp. 160–161. Helsinki, 1941.

The pests recorded are the Syrphid, *Chilosia illustrata*, Harr., which gnawed holes in parsnip roots in 1931, the Noctuid, *Euxoa* (*Agrotis*) *nigricans*, L., which damaged the stalks of onions in 1932, the Geometrid, *Cidaria* (*Larentia*) *fluctuata*, L., which fed on the leaves of turnip in 1934, and the Tineid, *Epermenia chaerophyllella*, Goeze, which skeletonised the leaves of carrot in 1940.

KANGAS (E.). **Beitrag zur Biologie und Gradation von *Diprion sertifer* Geoffr. (Hym., Tenthredinidae).** [A Contribution to Knowledge of the Biology and Mass Increase of *Neodiprion sertifer*.]—*Ann. ent. fenn.* **7** no. 1 pp. 1–31, 1 fig., 4 graphs, refs. Helsinki, 1941.

Outbreaks of *Neodiprion* (*Diprion*) *sertifer*, Geoffr., on pine in Finland are frequent but usually involve only comparatively restricted areas. A severe one occurred in a central district in 1932–33 [*cf. R.A.E.*, A **23** 425] and another in the east in 1939. The sawfly has one generation a year and overwinters in the egg. An account is given of the results of investigations on the cocoon population, begun in late August 1939, and the natural control of the sawfly is discussed with reference to these and data obtained during the earlier outbreak.

Cocoons collected from the forest litter in standard sampling plots in three districts were kept in the laboratory, where emergence of adult sawflies and

some parasites continued, as in nature, up to the end of September. The remaining sound cocoons were then returned to the forest and left under natural conditions until the following May, when they were again taken to the laboratory and kept at a temperature of about 18°C. [64·4°F.]. In the autumn, after fresh emergence, the remaining material was examined. The results showed that, on the average, 10 per cent. of the cocoons gave rise to adults in 1939 and 14 per cent. in 1940, 48 per cent. were parasitised, almost entirely by Ichneumonids, 13 per cent. were destroyed by predacious Elaterids, rodents and birds, and 15 per cent. dried out or were attacked by fungi. Among the parasitised cocoons, the percentages parasitised by Ichneumonids averaged 41·7 for *Microcryptus basizonus*, Grav., 37·3 for *Exenterus abruptorius*, Thnb., 0·7 for *E. amictorius*, Panz. (*marginatorius*, F.), 1·1 for *Lophyroplectus luteator*, Thnb., 2·4 for *Lamachus frutetorum*, Htg., 0·7 for *Torocampus* (*L.*) *eques*, Htg., and 13·9 for cases in which no emergence occurred, while the percentages parasitised by the Eulophid, *Microplectron fuscipenne*, Zett., and the Tachinid, *Sturmia inconspicua*, Mg., averaged 1·9 and 0·3 per cent., respectively. The relative frequency of the parasites is discussed, and a table is given showing all the parasites of Diprionine sawflies that have been recorded from Finland and the species that they attack there and in other parts of Europe. *M. basizonus* and several of the minor parasites have alternative hosts in Finland, so that they can maintain and sometimes increase their numbers, even though the population of *N. sertifer* is declining.

The proportion of cocoons that overwintered before giving rise to adults was high. It varies considerably with season and place, and examination of the remaining cocoons in the autumn of 1940 showed that a few still contained prepupae and would probably have overwintered again. The importance of this delayed emergence from the cocoon is discussed with reference to the maintenance of an outbreak and the parasite complex. Both *E. abruptorius* and *M. basizonus* emerged at the same time in the spring of 1940, before larvae of the current year were available for parasitism, though a few adults of *Microcryptus* appeared in the preceding September. These parasites therefore presumably oviposit in spring in the overwintering cocoons. It is concluded from the numbers of adults that emerged that the outbreak was declining in 1939, and that the local character of outbreaks in Finland is due to variations in the proportion of cocoons that overwinter.

GYÖRFI (J.). **Beiträge zur geographischen Verbreitung der Schlupfwespen in Finnland und zur Kenntnis deren Wirte.** [Contributions to the geographical Distribution of Hymenopterous Parasites in Finland and to Knowledge of their Hosts.]—*Ann. ent. fenn.* **7** no. 2 pp. 86–91. Helsinki, 1941.

The author gives records of parasitic Hymenoptera identified by him from material submitted from Finland, and in some cases of their hosts, and describes two new species reared by Kangas from larvae of pine weevils [*cf. R.A.E.*, A **27** 8]. These are *Ephialtes* (*Pimpla*) *kangasi*, from both *Pissodes notatus*, F., and *P. piniphilus*, Hbst., and *Coeloides brevicaudis*, from *P. notatus* and *P. validirostris*, Sahlb. Other species that have not previously been recorded from Finland include *Bracon* (*Orthobracon*) *efoveolatus*, Thoms., from *P. notatus*; *Microplectron fuscipenne*, Zett., and *Dibrachys cavus*, Wlk., from *Neodiprion* (*Lophyrus*) *sertifer*, Geoffr., on pine; *Monodontomerus dentipes*, Boh., from *Gilpinia* (*L.*) *abieticola*, D. T., or *G.* (*L.*) *polytoma*, Htg., on spruce; *Eutelus strobicola*, Ruschka, *Tetrastichus inunctus*, Nees, and *Hypocampsis contorticornis*, Ratz., from *Dasyneura* (*Perrisia*) *strobi*, Winn., and *Elachistus nigritulus*, Zett., from *Cydia* (*Laspeyresia*) *strobilella*, L., both on spruce cones; and *Stinoplus militaris*, Dalm., from *Phloeophthorus* (*Phthorophloeus*) *spinulosus*, Rey, on spruce and *Cryphalus* (*Trypophloeus*) *bispinulus*, Egg., on aspen.

KANGAS (E.). **Zur Biologie und Verbreitung der *Pissodes*-Arten (Col., Curculionidae) Finnlands. Nachtrag.** [On the Biology and Distribution of the Species of *Pissodes* of Finland. Appendix.]—*Ann. ent. fenn.* **7** no. 2 pp. 91–92, 3 refs. Helsinki, 1941.

In view of Györfi's identifications [*cf.* preceding abstract], the author states that the parasites recorded by him under generic names only in a previous paper [*R.A.E.*, A **27** 8] are *Ephialtes* (*Pimpla*) *kangasi*, Györfi, *Bracon* (*Orthobracon*) *efoveolatus*, Thoms., *Coeloides stigmaticus*, Hellén, and *C. brevicaudis*, Györfi, from *Pissodes notatus*, F., and *C. brevicaudis* from *P. validirostris*, Sahlb.

LOVÁSZY (P.). **Beobachtungen über die Biologie und das Auftreten des Fichtenzapfenwicklers (*Laspeyresia strobilella* L.) und seiner Parasiten.** [Observations on the Biology and Occurrence of the Spruce-cone Tortricid, *Cydia strobilella*, and its Parasites.]—*Ann. ent. fenn.* **7** no. 2 pp. 93–103, 3 figs., 1 map, 6 refs. Helsinki, 1941.

The results are given of observations by the author in 1940 on the habits, distribution and control by parasites of *Cydia* (*Laspeyresia*) *strobilella*, L., in spruce cones in Finland, supplemented by those of E. Kangas in 1937. Examination of infested cones showed that the larvae feed in the seeds, which they enter through one side and leave through the other, and that some of the older ones enter the axis of the cone and feed on the pith. This Tortricid has sometimes been thought to cause deformation of the cones and exudation of resin [*cf. R.A.E.*, A **32** 142], but such injury was found by the author to be due not to *C. strobilella*, but to *Hylemyia anthracina*, Czerny, or *Dioryctria abietella*, Schiff.

The percentages of cones infested by *C. strobilella* in the north, south and east of Finland in 1937 were 80·3, 17·3 and 17·4, respectively, and the numbers of larvae per 100 cones averaged 118·1, 20·2 and 13. The percentages of damaged seeds from the three regions were 19·3, 16·4 and 3·7, but *C. strobilella* was not alone responsible for this. Examination of data included by Trägårdh in a paper already noticed [**6** 90] showed that in Sweden also the moth is much commoner in the north than in the south.

The localities from which *C. strobilella* was recorded in Finland are shown on a map, together with the total percentage parasitism in each. The parasites reared comprised *Phaedroctonus* (*Nemeritis*) *cremastoides*, Holmgr., and *Elachistus nigritulus*, Zett., which were the most important, *Bracon* sp., near *anthracinus*, Nees, and *Ephialtes strobilellae*, L. (*glabratus*, Ratz.). Data on their frequency in the various regions are given in tables, in which it is shown that the total percentage parasitism averaged 25·7 in the north, 33·2 in the south and 46·9 in the east. With the exception of *Bracon* sp., which, like the host, is commoner in the north, the parasites were all more numerous in the south of Finland and are thought to be responsible for the lighter infestation there. Very brief notes on their habits are included.

KANGAS (E.). **Forstentomologische Studien an der Espe.** [Entomological Studies on Aspen in Forests.]—*Ann. ent. fenn.* **8** no. 1 pp. 49–71, 11 figs., 14 refs. Helsinki, 1942.

Investigations in 1938–40 in forests in various parts of Finland showed that mortality of aspen [*Populus tremula*] due to infestation of the trunk by insects was of three main types, distinguished by the insects involved. The most important in the south is that due to *Agrilus ater*, L., and associated insects

[*cf. R.A.E.*, A **30** 245], which cause the death of the trees within about five years, but there is another type there in which the main pest is *Poecilonota variolosa*, Payk., usually accompanied by *Trochilium* (*Aegeria*) *apiforme*, Cl., and *Saperda carcharias*, L., and frequently followed by *Xylotrechus rusticus*, L., *Cryphalus bispinulus*, Egg., *Cossus cossus*, L., and *Ptilinus fuscus*, Geoffr., though other, rarer, species may also be involved. Trees attacked by this complex die within ten years. The type found typical of the north, though it also occurs to some extent in the south, is due mainly to *S. carcharias*, followed principally by *X. rusticus* and *Cryphalus bispinulus*; *Necydalis major*, L., *S. populnea*, L., *Cossus cossus* and an unidentified moth, probably a Pyralid, were also sometimes present, and infested trees were rendered incapable of producing fresh leaves within periods as short as four years.

Analyses are given of the trunks of trees killed by these various combinations of insects, with notes on the relative importance of the individual species and on the bionomics of some of them. Most are confined to the region of the bast, though *Agrilus*, *Necydalis*, *Xylotrechus*, *Saperda* and *Cryphalus* sometimes penetrate deeper. Parasites reared in the course of the investigations [*cf.* **30** 246] were *Atanycolus* (*Bracon*) *heteropus*, Thoms., from *Poecilonota variolosa*; *Ephialtes manifestator*, L., and *Thalessa* (*Pimpla*) *curvipes*, Grav., from *N. major*; and *Stinoplus militaris*, Dalm., from *C. bispinulus*. *Cucujus cinnaberinus*, Scop., and the Staphylinid, *Dadobia immersa*, Erichs., were observed in the galleries of *Xyleborus cryptographus*, Ratz., and *Saperda carcharias*, respectively.

KANGAS (E.). **Forstentomologische Studien an einigen Laubhölzern.** [Entomological Studies on some deciduous Forest Trees.]—*Ann. ent. fenn.* **8** no. 2 pp. 142–163, 8 figs., 14 refs. Helsinki, 1942.

In connection with the work noticed in the preceding abstract, similar but less complete observations were also made in various forest regions of Finland on the boring insects responsible for the death of mountain ash [*Sorbus aucuparia*], sallow [*Salix caprea*], alder [*Alnus incana*] and birch, and the relative importance of the various species concerned is discussed at some length. The main species responsible for the death of *Sorbus aucuparia* were *Agrilus mendax*, Mannh., *Saperda scalaris*, L., *Cossus cossus*, L., and, in the extreme south, *Scolytus rugulosus*, Ratz., while *Hadrobregmus* (*Anobium*) *nitidus*, F., occurred in patches of the trees that had already lost their bark. Affected trees dried out gradually, and the process often lasted ten years. In the case of *Salix caprea*, the principal species were *Cryptorrhynchus* (*Cryptorrhynchidius*) *lapathi*, L., which was the most important, *Agrilus viridis*, L., *Aromia moschata*, L., *Lamia textor*, L., *Saperda scalaris*, *S. populnea*, L., *Xiphydria prolongata*, Geoffr., *Cossus cossus* and an unidentified moth, probably a Pyralid. Death was slow, since the trees produced new shoots from the stem and roots, and withering usually began in the crown and spread downwards. Analyses of infested trees of these two kinds are given and discussed at some length.

The complex associated with *Alnus incana* was less varied, and affected trees had generally already been attacked by the fungus, *Nectria cinnabarina*. The most important of the insects was *Dryocoetes alni*, Georg, followed by *Cryptorrhynchus lapathi*, *Saperda scalaris*, *Cossus cossus* and several less common secondary pests. Infested trees usually survived for at least five years. Mortality of birch was due chiefly to infestation by *Xylotrechus rusticus*, L., *S. scalaris*, *Scolytus ratzeburgi*, Jans., *Trypodendron signatum*, F., *C. cossus* and *Aegeria* (*Synanthedon*) *scoliaeformis*, Bkh., followed by various secondary pests and fungi. Trees attacked by *Scolytus ratzeburgi* usually died within two years or less, but mortality due to the other pests was less rapid.

KANERVO (V.). **Die Unterscheidung der Larven und Puppen von** *Eumerus tuberculatus* **Rond. und** *E. strigatus* **Fall. (Dipt., Syrphidae).** [The Differentiation of the Larvae and Pupae of *E. tuberculatus* and *E. strigatus*.]—*Ann. ent. fenn.* **8** no. 3–4 pp. 227–233, 3 figs., 4 refs. Helsinki, 1942.

As a result of further work on the bulb flies, *Eumerus tuberculatus*, Rond., and *E. strigatus*, Fall., in Finland [*cf. R.A.E.*, A **24** 261], the author points out that the names should be reversed in Hodson's key to the larvae of these two Syrphids [**20** 592]; he reproduces this key, and himself gives similar ones to the larvae and pupae. In breeding experiments at saturated atmosphere in 1935–37, larvae and pupae of *E. strigatus* developed somewhat more rapidly than those of *E. tuberculatus*; the differences were irregular in the case of the larvae, but amounted to about 1½ days at 27–32°C. [80·6–89·6°F.] and about 1 day at 17–22°C. [62·6–71·6°F.] for the pupae. When larvae were transferred in May 1936 from a cellar in which they had overwintered to the laboratory, where the temperature was 17–20°C. [62·6–68°F.], adults of *E. strigatus* emerged on the average about 5½ days before those of *E. tuberculatus*. Some pupae of both species were formed in the autumns of 1934 and 1935 and overwintered [*cf.* **24** 261], and it was observed in 1935 that they were formed in stocks that were kept in the laboratory until October. Although *E. strigatus* represented only 20 per cent. of the larval population, over 75 per cent. of the overwintering pupae belonged to this species. The percentage emergence from overwintered pupae was 60 in *E. strigatus* and only 20 in *E. tuberculatus*.

VAPPULA (N. A.). *Taeniocampa gracilis* **Fabr. (Lep., Noctuidae) als Schädling in Finnland.** [*T. gracilis* as a Pest in Finland.]—*Ann. ent. fenn.* **9** no. 1 pp. 29–31, 1 fig., 4 refs. Helsinki, 1943.

The terminal shoots of cultivated raspberry in a district in southern Finland were found in June 1939 to be webbed together by larvae of a Noctuid later identified as *Taeniocampa gracilis*, F. The larvae were again present on the canes in 1940 and were observed causing similar injury to wild raspberry, apple root suckers, *Filipendula ulmaria* and *Artemisia vulgaris*. Larvae from apple, raspberry and *Filipendula* were taken to the laboratory, where they pupated in sand in the first half of July and adults emerged in the following May. Parasites that emerged from some of the pupae in 1940 were *Neopales* (*Pales*) *pavida*, Mg., which was the most numerous, *Zenillia* (*Exorista*) *mitis*, Mg., and a single example of *Ephialtes* (*Epiurus*) *pictipes*, Grav. Infestation of raspberry in 1942 was less serious, and a single example of *Eulimneria* (*Limnerium*) *geniculata*, Grav., emerged from material taken to the laboratory. *T. gracilis* has recently been recorded as a pest in Estonia [*R.A.E.*, A **33** 119], but had previously been observed to be injurious in Finland only in 1931, when it attacked lucerne. On that occasion, one example of *Anilastus didymator*, Thnb., was reared from it. Its distribution there is apparently increasing.

TUURALA (O.). **Ueber photo- und geotaktische Umstimmung im Verlauf des Raupenlebens beim Kiefernspinner,** *Dendrolimus pini* **L. (Lep., Lasiocampidae).** [Changes in photo- and geotactic Reactions in the Course of Development of the Larvae of *D. pini*.]—*Ann. ent. fenn.* **9** no. 2 pp. 65–73, 4 graphs, 3 refs. Helsinki, 1943.

The larvae of *Dendrolimus pini*, L., used in the investigation described were reared on pine twigs in a laboratory in Finland at 16–22°C. [60·8–71·6°F.]. The technique of the experiments is described, and the results are given in tables and graphs and discussed. They showed that the larvae are strongly attracted to light in the first instar, somewhat less so in the second and indifferent to or even repelled by it in the third. Their geotactic reaction was

strongly negative in the first instar, less so in the second and mostly positive in the third, and the change to a positive reaction coincided with a reduction in feeding and an increase in general activity, indicating that they were preparing for hibernation. In nature, they descend from the trees and overwinter in the soil. The reactions must be inherited, since larvae of three laboratory-bred generations behaved alike.

LÄUGER (P.), MARTIN (H.) & MÜLLER (P.). **Ueber Konstitution und toxische Wirkung von natürlichen und neuen synthetischen insektentötenden Stoffen.** [The Constitution and toxic Effect of natural and recent synthetic insecticidal Materials.]—*Helv. chim. Acta* **27** fasc. 4 pp. 892–928, 4 pls., 2 figs. Basle, 1944.

The information in this detailed account of the research that led to the discovery of the insecticidal properties of DDT has already been noticed from the first part of a shorter paper [*R.A.E.*, A **33** 137].

WILSON (J. D.) & SLEESMAN (J. P.). **Possible Influences of new organic Pesticides on experimental Test Procedure.**—*Bi-m. Bull. Ohio agric. Exp. Sta.* **30** no. 232 pp. 27–30. Wooster, Ohio, 1945.

The following is based on the authors' summary. The recent introduction of several organic insecticides and fungicides with various unknown properties has made it difficult to avoid mistakes in comparative tests. Factors to be considered in dealing with these new materials, some of which are extremely effective even in low concentrations, are incompatibility, with its possible effect on control and injury to plants, and the effect of possible contamination of other materials used in comparative tests by even the small amounts that may cling to the inside walls of spraying equipment or that may drift from plot to plot during application. Some of the results of a comparison of sprays for the control of leafhoppers [*Empoasca fabae*, Harr.] on potato in Ohio are given in tables and show that the drift of small amounts of DDT from plot to plot during application and the persistence of the same material inside the spray equipment to contaminate the next insecticide to be tested were sufficient to reduce leafhopper populations materially and to increase the yields of sprayed potatoes. The drift effect was distinguishable for a distance of about 8 ft. on each side of rows treated with DDT.

Many of the precautions necessary to improve testing procedure will be discovered only by trial and error, but in the meantime, a better knowledge is required of minimum effective dosages, the maximum intervals over which protection prevails and the minimum spacing or number of buffer rows necessary between test rows or plots to avoid drift effects. Precautionary measures to minimise contamination and to improve testing technique should include the application of materials only in the absence of moderate to strong wind; extreme care in the rinsing of apparatus, together with the possible use of solvents, divided or separate tanks or even separate equipment when spraying; careful emptying and cleaning of dusters; and special consideration of plot spacing and arrangement.

WRIGHT (D. W.) & ASHBY (D. G.). **The Control of the Carrot Fly (*Psila rosae*, Fab.) (Diptera) with DDT.**—*Bull. ent. Res.* **36** pt. 3 pp. 253–268, 4 figs., 4 refs. London, 1945.

In experiments in Switzerland [*cf. R.A.E.*, A **33** 288], good control of *Psila rosae*, F., on carrots was given by Guesapon [Gesapon], a proprietary emulsion stated to contain 5 per cent. DDT, used at concentrations of 0·5–1 per cent. against the first generation and 2 per cent. against the second. The

diluted emulsion was applied from a watering can at the rate of about 6 pints per sq. yd., and one application was sufficient in each case. It was claimed that it acted as a soil insecticide and that the newly-hatched larvae were destroyed while moving to the roots. These experiments were repeated in small contiguous plots at Cambridge, with the emulsion at concentrations of 1 and 4 per cent. against the first generation and at 1, 2 and 4 per cent. against the second. The higher concentration gave a marked reduction in attack by the first generation, all concentrations gave about 72 per cent. control of the second, the differences between them not being significant, and a single application of the 4 per cent. emulsion on 22nd May against the first generation appreciably reduced second-generation attack. When the rate of application was reduced to 1 pint per yard run of row and the emulsion was applied either to the foliage or direct to the soil the foliage treatment was the more effective ; in either case, two treatments on 26th July and 9th August gave better control than one on 26th July. When 2 and 4 per cent. Guesapon was applied at the higher rate to plots in a field of carrots on fen soil on 25th July prior to the emergence of summer-generation adults, infestation on 6th November was 56 and 41·5 per cent., respectively, and that on the controls was 65·3 per cent.

The effectiveness of the foliage treatment suggested that the DDT was acting on the adult flies and not as a soil insecticide, and this would explain the lack of marked differences between plots receiving different amounts of DDT, since the flies could migrate between the plots. Action on the adults was therefore studied in the laboratory with a mixture of 10 gm. commercial DDT and 1 gm. cyclohexylamine dodecyl sulphate dissolved in 27 gm. xylene, which when diluted with water to give 1 per cent. DDT made a very stable emulsion. In one experiment, carrot foliage was sprayed with this emulsion in the field in August, and flies were caged for periods of 24 or 6 hours with samples picked at successive intervals after treatment. Mortality of flies exposed for 24 hours was complete for 26 days after the date of application, despite the occurrence of extremes of heat and rain, and appreciable after a further 38 days. The records for the shorter period of exposure, however, indicated that a reduction in toxicity began at once and became marked after 26 days. In other experiments, there was little difference in the control given after 14 days by the deposit on the foliage of plants that were sprayed with a 0·5 or 1 per cent. emulsion and protected from rain and direct sunlight and that on similarly protected plants that were watered heavily every two days, but evidence was obtained that deterioration is more rapid under natural weather conditions. It was also shown that effectiveness persists after the foliage is dead and that it is almost as lasting on potato as on carrot leaves. Emulsions containing 1 and 0·5 per cent. DDT were about equal in toxicity and persistence, but the weaker emulsion acted more slowly. An experiment in which the flies were caused to walk continuously on a dry deposit from the 1 per cent. emulsion indicated that contact for 60 seconds or more results in high rates of mortality while contact for 30 seconds does not. It appeared that the flies absorb the DDT through the feet ; symptoms of poisoning, which are described, appeared 1–2 hours after treatment, and death ensued after 6–24 hours.

In an experiment under field conditions, cages were placed over carrot plants on 25th August, when summer-generation emergence had begun, and the plants and cage walls were sprayed with emulsions containing 0·5 and 1 per cent. DDT. All living and dead flies were removed and counted every 3–4 days for a month and then every week until the end of October. The mortality percentages for both concentrations were high throughout the period, averaging 87·7 and 96·6, respectively, in September and October, as compared with 14·2 in the controls, the superiority of the higher one being most marked just before the intervals between counts were increased. Examination of the roots and the soil surrounding them on 30th October showed that populations of larvae and injury to the roots were much lower on the treated plants than on the controls,

the reduction by both concentrations being about the same. Dead insects other than *P. rosae* were abundant in the cages over treated foliage; the numbers of the various Orders and families are given in a table. The injurious insects killed included *Forficula auricularia*, L., *Lygus pabulinus*, L., and several Coleoptera, and the beneficial ones were three Coccinellids, *Syrphus luniger*, Mg., and *Dacnusa gracilis*, Nees, the Braconid parasite of *Psila rosae*. Aphids became abundant on untreated, but not on treated, foliage by the end of October. In laboratory tests, the cabbage aphis (*Brevicoryne brassicae*, L.) was killed by a spray deposit of DDT, but it was also found that individuals showing symptoms of poisoning were able to oviposit or to produce young that developed normally when transferred to untreated leaves.

In a field trial in which carrots over an area of 2½ acres were sprayed on 15th September at the rate of about 50 gals. per acre, with an emulsion that contained 0·5 per cent. DDT and in which solvent naphtha was substituted for xylene, sweeping showed a rapid decrease in numbers of flies and high mortalities were observed. There was no comparable reduction in populations on untreated plants in or near the field. The effects of the treatment persisted for about 21 days, after which the numbers of flies increased somewhat; this is attributed at least in part to the growth of vegetation, notably weeds, which provide cover. On 8th November, the percentage of damaged roots and the numbers of larvae present were lower, and the proportion of young larvae smaller, in the treated area than in untreated ones.

RICHARDS (O. W.). **The Effect of Mercury Vapour on the Eggs of *Calandra granaria* (L.) (Col., Curculionidae).**—*Bull. ent. Res.* **36** pt. 3 pp. 283–290, 1 fig., 1 ref. London, 1945.

The experiments described were carried out after it was observed that eggs of *Calandra granaria*, L., did not hatch in an incubator into which mercury had leaked from a broken thermometer [*cf.* also *R.A.E.*, A **32** 418]. The temperature was usually 25°C. [77°F.], and the moisture content of the wheat used was about 14·2 per cent. Under these conditions, the egg stage lasted about five days. When mercury was not present, about the same percentage hatch was observed among eggs laid over a period of two days and examined 6–10 days after oviposition, and an apparent increase in fertility observed after a longer period is attributed to the destruction of some infertile eggs by young larvae. Eggs laid in wheat that had previously been exposed to mercury vapour for 20 days were not affected, but no eggs hatched when the grain containing them was exposed for periods of 1–10 days to an atmosphere saturated with mercury vapour. In a subsequent similar experiment, 10·1 and 1·1 per cent. of the eggs hatched after exposure for 8 and 24 hours, as compared with 81 per cent. in the controls; some larvae that emerged from the treated eggs were dead when the grains were dissected. In 26·8 per cent. of the eggs exposed for 8 hours and 6·7 of these exposed for 24, there was some embryonic development, but the eggs did not hatch. It is therefore probable that development does not occur while the eggs are exposed to the vapour, but that some, depending on the length of exposure, may take place later. At 10°C. [50°F.] the percentages of eggs that hatched in the controls and after exposure periods of 24, 48 and 72 hours were 66, 33, 8·4 and 4·8, respectively. The difference in the observed toxicity at 25 and 10°C. is greater than can be accounted for by differences in the vapour tension of the mercury at these temperatures, and it is possible that the susceptibility of the eggs increases to some extent as development proceeds, since nearly half the development is completed in two days at 25°, whereas it has hardly begun after three at 10°. In further experiments, mercury vapour was found capable of penetrating upwards through grain for at least 12, but not 24, inches in two days at 25°C. and for at least 36 inches in seven days at 12°C. [53·6°F.].

ARTHUR (D. R.). **The Development of artificially introduced Infestations of *Aphidius granarius*, Marsh., under Field Conditions.**—*Bull. ent. Res.* **36** pt. 3 pp. 291–295, 2 figs., 5 refs. London, 1945.

Investigations were undertaken in three localities in South Wales in 1943 and 1944 to determine the effectiveness of releasing *Aphidius granarius*, Marsh., for the control of Aphids infesting wheat in fields in which natural parasitism by this Braconid was low. *Macrosiphum* (*Myzus*) *festucae*, Theo., was the predominant Aphid in the 15 fields under experiment, the other species present being *Macrosiphum avenae*, F. (*granarium*, Kby.) and *Rhopalosiphum prunifoliae*, Fitch, (*Aphis avenae*, auct.). All three Aphids are attacked by *Aphidius granarius* in the field [*cf. R.A.E.*, A **33** 394], parasitism being greatest during April–June. As control is required in the earlier part of the year, when Aphid attack is most prevalent, the experiments were begun early in March. The fields were divided into three sections, extending across their width, and sets of nine muslin gauze cages, open at the base and each enclosing an area of 2 sq. ft. and stocked with ten fertilised female parasites, were arranged in one or other of five patterns in one of the sections in each field. The cages were removed after 23–25 days, and counts of parasitised Aphids were made at intervals of 21–30 days until the end of June. By mid-May, parasitism in the section in which the liberation was made was highest (73 per cent.) and the effects of the liberation extended farthest in fields in which the cages were concentrated in a block in the central section ; where they were placed in lines in any section parasitism was high in their immediate vicinity, but low elsewhere. The effectiveness of the block liberation is attributed to the influence of meteorological conditions on the flight of the adult parasites, since the centre of the field is hotter and less shaded than the rest and remains warm for a longer period during the day. Parasitism continued to increase in all the fields until the end of June, when it reached about 90 per cent. in the central section of the field in which the cages had been arranged in a block, and 74 and 57 per cent. in the other two sections.

HALL (W. J.). **The Identity of a Mealybug Vector of "Swollen Shoot" Virus Disease of Cacao in West Africa.**—*Bull. ent. Res.* **36** pt. 3 pp. 305–313, 1 fig. London, 1945.

From examination of the types and an extensive series of specimens collected in Sierra Leone, the Gold Coast, the Ivory Coast, Nigeria and British and French Togoland, mainly in 1943–45, the author concludes that *Pseudococcus exitiabilis*, Laing [*cf. R.A.E.*, A **32** 246] is a synonym of *P. njalensis*, Laing [**18** 330]. He shows that the species is extremely variable, but differs from other species of *Pseudococcus* in that groups of pores are constantly present on the dorsal dermis of the females, and discusses the variations in some important morphological characters at some length.

The mealybug was collected on upwards of 20 food-plants in 14 families, including cultivated coffee in Sierra Leone and British Togoland and *Ceiba pentandra* and pineapple in the Gold Coast. It was found on cacao in all the colonies and territories from which specimens were received and has been reported to be a vector of the swollen-shoot virus disease of cacao in the Gold Coast [**32** 246]. It is nearly always associated with ants of the genera *Crematogaster*, *Pheidole* and *Camponotus*, but no evidence was obtained that any one form of the species is associated exclusively with any particular locality, food-plant or species of ant.

GADD (C. H.). **Ceylon Euplectrini (Hym.).**—*Bull. ent. Res.* **36** pt. 3 pp. 331–337, 3 figs., 4 refs. London, 1945.

The author comments on some points in Ferrière's revision of the Euplectrini [*R.A.E.*, A **29** 513] and gives descriptions of both sexes of *Autoplectrus*

taprobanes, gen. et sp.n., reared from larvae of *Spatulifimbria castaneiceps*, Hmps., and *Thosea cervina*, Moore, both sexes of *Metaplectrus solitarius*, sp. n., from *T. cervina* and *Narosa conspersa*, Wlk., the male of *M. thoseae*, Ferrière, from *T. cervina*, and the propodeum of *Platyplectrus natadae*, Ferrière, all from Ceylon.

ROONWAL (M. L.). **Notes on the Bionomics of *Hieroglyphus nigrorepletus*, Bolivar (Orthoptera, Acrididae) at Benares, United Provinces, India.**—*Bull. ent. Res.* **36** pt. 3 pp. 339–341, 8 refs. London, 1945.

Since *Hieroglyphus nigrorepletus*, Bol., was frequently confused in the early literature with *H. banian*, F. (*furcifer*, Serv.) observations on its bionomics were made at Benares in 1942–44. During this period, heavy infestations were recorded each year on maize, sorghum, hemp and sugar-cane over an enclosed area of about three acres. They lasted from the beginning of July until the end of September, and reached their peak in August, when most of the hoppers completed their development. Eggs were laid in the soil in the second half of August and early September and did not hatch until the following June or early July, soon after the beginning of the rains. Most of the adults belonged to a common form with short wings that cannot fly. Birds of two species were occasionally seen feeding on them. Fairly shallow ploughing each year in September and flooding due to exceptionally heavy rains in late September 1943 had no appreciable effect in reducing infestation.

Other plants reported to be attacked by *H. nigrorepletus* are *Pennisetum typhoideum*, *Setaria italica* and rice [*R.A.E.*, A **10** 529]

MATTHÉE (J. J.). **Biochemical Differences between the solitary and gregarious Phases of Locusts and Noctuids.**—*Bull. ent. Res.* **36** pt. 3 pp. 343–371, 23 refs. London, 1945.

A detailed account is given of an investigation in South Africa to ascertain whether the differences in activity between the solitary and gregarious phases in locusts and in armyworms [*cf. R.A.E.*, A **32** 285] are accompanied by biochemical differences. Determinations were made of the lactic and uric acid contents, which were expected to be high in the more active individuals, the hydrogen-ion concentration of the blood, and, in view of the higher rate of metabolism known to occur in the gregarious phase [**24** 229], the fat and moisture contents of individuals in both phases. The material used comprised fifth-instar hoppers of *Locusta migratoria migratorioides*, R. & F., and *Locustana pardalina*, Wlk., and last-instar larvae and pupae of *Laphygma exempta*, Wlk., all in the two phases, and last-instar larvae and pupae of *Spodoptera abyssinia*, Gn., attributed to the two phases [*cf.* **32** 286] from the conditions of rearing and colour of the larvae; in most cases the insects were reared in crowds or isolation in the laboratory by methods that are described.

In general, the lactic acid content was found to be greater in the gregarious than in the solitary phase in the armyworms, but not in the locusts; on this basis, *Locustana* appears to be more active than *Locusta*, and *Laphygma* than *Spodoptera*. Uric acid was consistently more abundant and the fat-content consistently lower in the solitary than in the gregarious phase in all four insects, and the uric-acid content was exceptionally high in larvae of *Laphygma*. Marked differences in the moisture content were observed only in *Laphygma* and *Locustana*, in both of which it was higher in the solitary phase. The pH values of the blood were measured only in the case of *Locusta* and *Laphygma*; in both, they were lower in the gregarious phase.

RAHMAN (K. A.) & DALBIR SINGH. **Estimation of Sugarcane Top-borer (*Scirpophaga nivella* F.) Infestation.**—*Indian J. agric. Sci.* **14** pt. 3 pp. 233–239, 2 refs. New Delhi, 1944.

The following is based on the authors' summary. Since *Scirpophaga nivella*, F., is a serious pest of sugar-cane in the Punjab, it is often necessary to determine

accurately the extent of infestation, and the results are therefore given of a statistical investigation carried out to determine the size of plot necessary to give reliable information. The figures for percentages of canes infested in samples of various sizes and shapes were examined statistically, and the limits of accuracy determined, and a sample of 500 canes was found to give sufficiently accurate results for ordinary routine work. Increasing the size of the sample appeared to give very little improvement in precision, but taking long narrow strips of the crop for counting purposes increased the accuracy. In special cases in which greater precision is needed, three or six replications of the sample, consisting of 500 canes from strips with the length and breadth in the ratio of 10 : 1 or 2·5 : 1, respectively, should be taken.

Bozkaya (E.). **Süne makinesi.** [Cereal-bug Machine.]—39 pp., 16 figs., 9 refs. Istanbul, Hüsnütabiat Basimevi, 1945. (With Summaries in English, French and German.)

Eurygaster integriceps, Put., causes great damage to wheat in south-eastern Turkey. The only method of control so far used is hand-collection, which is not satisfactory. The author has therefore designed and describes in detail in this paper a mechanical collector that is pushed through the fields by a horse and in tests removed 80 per cent. of the bugs from wheat. It consists essentially of six wide horizontal brushes revolving on an axis mounted above a pair of wheels. The axis is rotated by a belt from the wheels, and the brushes sweep the bugs from the plants into a hooded container placed just behind them. The height of the brushes from the ground can be adjusted to that of the plants, and the machine causes no injury to the crop.

Machotin (A.). **Behaviour of** *Eurygaster integriceps* **Put. at different Temperatures in the Experiment and in the Field.**—*C. R. Acad. Sci. URSS* (N.S.) **47** no. 8 pp. 580–582, 1 graph. Moscow, 1945.

An account is given of laboratory and field observations near Krasnodar, North Caucasus, in 1941 on the effect of temperature on the activity of the Pentatomid, *Eurygaster integriceps*, Put. In the laboratory, adults and nymphs of the second and subsequent instars began to move at about 6–12°C. [42·8–53·6°F.] and crawled actively at 15–30°C. [59–86°F.]. A state of quiescence occurred between 30 and 37°C. [98·6°F.], which probably has the effect of avoiding an excessive increase in body temperature, but a further rise in temperature resulted in extreme activity; death occurred in 3–6 minutes at 49–49·5°C. [120·2–121·1°F.]. The reactions of first-instar nymphs were not regular.

The behaviour of the bugs was observed in the field for 24 hours in June on a small area in a stand of wheat. At sunset (about 9 p.m.), they were at the tops of the wheat stalks and they remained there throughout the night. At sunrise (about 5 a.m.), they moved to the east side of the ears, but as the temperature rose and the humidity fell, they congregated for a time on the shady side of the plants and then descended to the ground. They sheltered in cracks or wandered on the soil from about 11 a.m. until 2–3 p.m., when they again ascended the plants. During this period of inactivity, the relative humidity fell from 84 to 48 per cent., the temperature of the air rose from 31·5 to 34°C. [88·7–93·2°F.], and the temperature of the soil surface in the shade was about 35·5°C. [95·9°F.] but rose to 39°C. [102·2°F.] between 2 and 3 p.m.

News of Science and Technique. [*In Russian.*]—*Social. Sci. Techn.* **7** no. 11–12 pp. 189–197. Tashkent, 1939.

It is stated in **A new Method of applying an Insecticide to the Soil,** pp. 189–191, that since sprays for the control of adults of the apricot weevil

[*Rhynchites auratus ferganensis*, Nevsk.] in Central Asia scorch the leaves of apricot and cause the fruits to fall [*cf. R.A.E.*, A **25** 150, 151], experiments were carried out by E. N. Ivanov in Ferghana on the control of the larvae in the soil [*cf.* **17** 587] by applying emulsions of chlorpicrin in the water used for irrigation. The dosages tested in 1938 ranged from 1·8 to 90 lb. emulsified chlorpicrin per acre, and it was found that the effectiveness of the fumigant varied inversely with the amount of water in which it was applied, a dosage of about 27 lb. giving 85 per cent. mortality when the amount of water was 45,000 gals. and 48 per cent. when it was 90,000. In field experiments in 1939, a dosage of 54 lb. emulsified chlorpicrin per acre applied in 45,000 gals. water gave 98–100 per cent. mortality. The poison was equally distributed over the plots, and the treatment was economical of labour.

A new Preparation for the Control of agricultural Pests, p. 193, records field tests in Uzbekistan in which a spray containing 0·004 per cent. pyrethrum extract (2 per cent. pyrethrin I) and 0·2 per cent. soap caused 96·3 per cent. of the adults of *R. a. ferganensis* on apricot to drop to the ground, and 50–60 per cent. of those that did so died in 10–11 days. When the soap content was increased to 1 per cent., the percentage mortality in the same period was 91·5. Spraying also caused 93·6 per cent. of larvae of the apricot Noctuid [*Cosmia subtilis*, Stgr.] to fall from the trees.

In **New Vegetable Poisons against the Web Mite,** p. 197, it is stated that, in view of the shortage of the sulphur preparations commonly used to control *Tetranychus* (*Eotetranychus*) *turkestani*, Ugar. & Nik., on cotton in Central Asia, a study was made by Khabirova in 1937 and 1938 of the toxicity to the mite of preparations of various wild plants. In preliminary laboratory and field tests, infusions of *Achillea micrantha*, *Convolvulus* (*Calystegia*) *sepium* and *Hyoscyamus niger* gave 94, 95·6 and 88·9 per cent. mortality, respectively, and did not injure the cotton. Extracts of *A. micrantha* and *A. millefolium*, prepared with dichlorethane and applied at concentrations of 0·15 and 0·075 per cent., respectively, killed 67·1 and 98·6 per cent. of the mites, and a 1 per cent. solution of sophocarpin, a pure alkaloid from *Ammothamnus lehmanni*, gave up to 61 per cent. mortality.

HASEMAN (L.). **Control of Termites.**—*Bull. Mo. agric. Exp. Sta.* no. 478, 15 pp., 8 figs. Columbia, Mo., 1944.

Damage by the underground termite that is important in Missouri [*Reticulitermes flavipes*, Koll.] has been increasing in recent years. It nests below the frost-line in the soil and causes much injury to posts and the woodwork of buildings. An account is given of its bionomics and the control measures usually recommended against subterranean termites.

GARMAN (P.). **Control of the Apple Maggot with Rotenone Dusts.**—*Bull. Conn. agric. Exp. Sta.* no. 474 pp. 435–442, 3 refs. New Haven, Conn., 1943.

Since adults of *Rhagoletis pomonella*, Walsh, occasionally persist in apple orchards in Connecticut after the beginning of August, when it is no longer desirable to apply lead-arsenate sprays to the fruit, experiments were carried out in 1936–42 on the effectiveness of sprays and dusts containing rotenone for their control. Some of these have already been noticed from annual reports.

In laboratory experiments in 1936–37, the flies were caged with small dusted or sprayed apples at a temperature of 75–76°F., and approximately 60 per cent. relative humidity. The percentages that died in 20 days and (in brackets) the average numbers of egg-punctures per female were 100 (0·18) for a commercial dust containing 0·75 per cent. rotenone, 90·9 (0·68) for a

spray of derris root (4 per cent. rotenone), 84·1 (3·3), 60 (4·8) and 71·1 (3·7) for sprays of lead, calcium and basic zinc arsenate, and 57·6 (7·9) for a spray of phenothiazine, as compared with 19·6 (40·7) in the control [*cf. R.A.E.*, A **31** 505] ; all sprays contained 3 gm. each of poison and wheat flour per 800 cc. The results of experiments in 1940 in which attempts were made to reduce the decomposition of rotenone by light [*cf.* **30** 549] were confirmed in 1942, when dusts of 0·5 per cent. rotenone in red clay or red slate gave complete mortality in 48 hours after exposure to ultraviolet light for 24 hours, whereas one of 0·5 per cent. rotenone in white talc gave 0–22 per cent. mortality under sim lar conditions ; all dusts gave complete mortality in 24 hours when they had not been exposed to the light.

Field tests gave rather unsatisfactory results in 1937 and 1938 [*cf.* **28** 643], but in one orchard, four applications of a dust containing 0·5 per cent. rotenone (as derris or cubé) and 4 per cent. white lubricating oil (viscosity 80) in pyrophyllite resulted in only 3·3 per cent. infestation of picked fruit and 21·4 per cent. of fallen fruit in 1939, and five applications resulted in 7 per cent. infestation of picked fruit and 26 per cent. of fallen fruit in 1940 [*cf.* **31** 505]. Infestation in a heavily attacked orchard was 25 per cent. less in 1940, after treatment with the same dust five times at intervals of a week, than in 1939, 66·6 per cent. less in 1941 after four treatments at intervals of two weeks and 78·5 per cent. less in 1942 after five treatments at intervals of 10–14 days ; infestation continued to be heavy in untreated trees in 1940 and 1941.

It is evident that rotenone dusts are of value, and it was found that they can be applied until within a week of harvest without giving objectionable residues ; owing to their high cost, however, their use should be limited to orchards in which the flies still remain on the apples when it is no longer safe to apply lead arsenate. They had little or no effect in preventing outbreaks of the European red mite [*Paratetranychus pilosus*, C. & F.], but applications in July apparently caused some mortality of adults of the white apple leafhopper [*Typhlocyba pomaria*, McAtee].

Overholser (E. L.), Allmendinger (D. F.) & Overley (F. L.). **The Effect of certain Sprays upon the apparent photosynthetic Activity of Apple Trees.**—*Bull. Wash. agric. Exp. Sta.* no. 447, 28 pp., 6 refs. Pullman, Wash., 1944.

An account is given of experiments in Washington in 1935–41 on the extent to which certain spray materials and schedules for the control of the codling moth [*Cydia pomonella*, L.] and mites on apple damage the foliage of the trees. The formulae tested included Dynamite (inverted) sprays [*cf. R.A.E.*, A **26** 174, etc.], chiefly of 3 lb. lead or calcium arsenate, 2 U.S. quarts medium mineral oil, 0·17 lb. ammonium oleate and 4 oz. zinc sulphate per 100 U.S. gals., and modified Dynamite sprays of 3 lb. lead arsenate or cryolite with 1 U.S. pint herring oil, 3 U.S. pints kerosene or stove oil, 0·17 lb. ammonium oleate and 2 or 4 oz. zinc sulphate per 100 U.S. gals. Cryolite was the only fluorine compound used.

The following is the authors' summary. The use of medium and light-medium oils throughout the season in the control of codling moth tends to lower the apparent carbon dioxide intake of apple leaves. The use of light-medium oil with fluorine throughout the season reduced the carbon dioxide intake of apple leaves. The use of light mineral oil with first brood codling moth sprays involving lead arsenate and nicotine sulphate, or lead arsenate and calcium arsenate, or lead arsenate or modified Dynamite, followed in each case by fluorine second brood sprays, did not reduce carbon dioxide intake of apple leaves. The use of light mineral oil and lead arsenate throughout the season did not significantly lower the carbon dioxide intake of apple leaves. The use of either lead arsenate or calcium arsenate Dynamite combinations

even when followed by second brood fluorine sprays reduced the carbon dioxide intake of apple leaves. Modified Dynamite sprays were not so serious in their reduction of carbon dioxide intake by apple leaves as were the Dynamite sprays. Herring oil in the relatively small amount recommended (1 pint per 100 gals.) tends to be less injurious to foliage than medium (65–75 viscosity) or light-medium (60–65 viscosity) mineral oils at larger concentrations of ½–1 gal. per 100 gals. used commercially. The use of calcium arsenate with mineral oil is less likely to reduce carbon dioxide intake of apple leaves than is the use of lead arsenate with the same amounts of comparable oils. Calcium arsenate with adequate amounts of " safeners " such as zinc sulphate and calcium hydrate may be used without materially affecting the carbon dioxide intake of apple leaves. The use of oils with nicotine sulphate, without other materials, resulted in a greater reduction of carbon dioxide intake by apple leaves than when comparable oils in similar amounts were used with calcium arsenate, lead arsenate, or bentonite.

FRANKLIN (H. J.) & others. **The Cranberry Station, East Wareham, Massachusetts.**—*Bull. Mass. agric. Exp. Sta.* no. 417 (Rep. 1943–44) pp. 28–30. Amherst, Mass., 1944.

In 1943, infestation of cranberry by *Tlascala finitella*, Wlk., continued to be extensive in the same bog in Massachusetts as in previous years [*cf. R.A.E.*, A **32** 250, etc.]. Although the bog was completely flooded for 36 hours in early June to prevent oviposition and again nine days later to kill the larvae, the latter became very abundant on the plants, apparently because many moths escaped the first flooding by flying ashore and then returned to the bog to oviposit. The egg-stage lasted 5–6 days in the laboratory. A serious outbreak of *Tortrix* (*Cacoecia*) *parallela*, Rob., occurred at the end of May in the same bog as in 1942 [*cf. loc. cit.*] but was completely controlled by flooding for 30 hours on 5th and 6th June; the winter water had been removed from this bog on 10th May. A rather severe infestation by *A*[*spidaspis*] *oxycoccus*, Woglum, on part of a large bog was successfully controlled in early spring, after the removal of the winter water, by a spray of 16 lb. dry lime-sulphur per 100 U.S. gals. water, applied at the rate of about 500 U.S. gals. per acre, which killed nearly all the scales with hardly any damage to the plants or fruit. A proprietary oil emulsion was equally effective against the Coccid, but stunted the berries and retarded new growth. Most of the other insects that attack cranberry were normally abundant, but *Mineola* [*vaccinii*, Ril.] and *Crambus* [*hortuellus*, Hb.] were much more prevalent than they had been for a number of years.

A report received from C. H. Hadley on the results of experiments on the susceptibility of larvae of *Anomala lucicola*, F., to *Bacillus popilliae* (which causes type A milky disease of *Popillia japonica*, Newm.) is quoted; positive evidence of infection was obtained in only five of ten larvae inoculated by direct injection, and in none of 20 larvae exposed in soil in which the concentration of spores was 2,000 million per kg. and then incubated at 86°F. until all had pupated or died. It appears therefore that this Rutelid possesses a relatively high degree of natural immunity.

ALEXANDER (C. P.) & others. **Department of Entomology.**—*Bull. Mass. agric. Exp. Sta.* no. 417 (Rep. 1943–44) pp. 33–43. Amherst, Mass., 1944.

Most of the insect pests of apple in Massachusetts were favoured by weather in 1943, and examination of the fruit at harvest showed 23 and 17 per cent. damage due to the codling moth [*Cydia pomonella*, L.] and the plum curculio [*Conotrachelus nenuphar*, Hbst.], respectively, on plots at Amherst that had received the standard spray schedule; the corresponding figures for unsprayed

trees were 72 and 66. A special application of fixed nicotine between the second and third cover sprays reduced the percentage damage by *Cydia* to 13, the substitution of a fixed-nicotine spray for lead arsenate in the fourth cover spray reduced it to 7, and this with an additional application of fixed nicotine in mid-August to 5. At Waltham, 90–100 per cent. of the apples on unsprayed trees were damaged by *Conotrachelus*, and in further tests on the effect of different rates of application [*cf.* *R.A.E.*, A **32** 252], a rate of ¾ U.S. gal. per 100 sq. ft. of tree area was inadequate against such heavy infestation, 1 U.S. gal. was best and 1¼ U.S. gals. gave inconsistent results. A spray of DN-111 [a preparation containing about 20 per cent. of a dicylohexylamine salt of dinitro-o-cyclohexylphenol] applied at the rate of 1 lb. per 100 U.S. gals. to tender foliage at the pink and calyx periods, gave no control and caused bleaching of the leaf veins. A general outbreak of *Lithocolletis blancardella*, F., occurred throughout two counties, and many of the infested trees lost one-third or more of their leaves. Reports indicate that this leaf-miner is likely to be abundant for 2–3 years before being controlled by parasites; spraying with nicotine sulphate during the oviposition period should give satisfactory control. There are usually three generations a year, but if the first is controlled at about the pink-bud stage, further infestation will be prevented.

In tests to study the effect on apple of adding DN-111 to the standard spray of lead arsenate and wettable sulphur in the applications immediately following bloom, the calyx application, made on 27th May, during a period of moderate temperature and humidity, caused no plant injury. The first cover spray (3rd June) was followed by general scorching, but the falling of the most seriously affected leaves and the development of new growth had nearly obliterated the injury by mid-July, and no appreciable reduction in yield was noted. Applications to peach, pear, plum and cherry on 20th July and 9th August caused no ill effects, although temperatures rose to 80°F. or above after treatment. Both DN-111 and D-4 dust [approximately 1·5 per cent. of a dicyclohexylamine salt of dinitro-o-cyclohexylphenol] caused moderate or serious injury to most of some 20 different deciduous ornamental plants when applied during June at moderate temperatures, but none when applied in late July or August, even at temperatures as high as 84°F. The D-4 dust reduced the population of red mites by 97 per cent. in 24 hours and DN-111 reduced it by 95 per cent. when used at 1¼ lb. and by 98 per cent. at 1 lb. per 100 U.S. gals.; the difference in results was due to difficulty in securing thorough coverage. When sprays of 1 lb. DN-111 alone or with 3 lb. lead arsenate and 4 lb. wettable sulphur per 100 U.S. gals. were applied to apple trees infested with 18–21 examples of the European red mite [*Paratetranychus pilosus*, C. & F.] per leaf on 28th July, the populations showed reductions of 98 and 97 per cent. six and 13 days after treatment, as compared with natural reductions on unsprayed trees of 11 and 94 per cent. A spray of 1 lb. DN-111 per 100 U.S. gals. applied on 31st August to trees infested with 381 examples of the white apple leafhopper [*Typhlocyba pomaria*, McAtee] per 100 leaves reduced the population by 94·7 per cent. in eight days, as compared with a decrease of 9·02 per cent. on unsprayed trees [*cf.* **32** 371].

Infestation of squash by the squash vine borer [*Melittia satyriniformis*, Hb.] was moderately severe in 1943, but four applications at weekly intervals during July of sprays of 0·4 per cent. nicotine sulphate and of 0·2 per cent. nicotine sulphate with 1 per cent. Volck oil reduced the injury by 72 and 80 per cent., respectively. The addition of Bordeaux mixture (4 : 4 : 100) to these sprays caused no significant difference in control or yield, but the addition of 33 per cent. cryolite to a dust containing nicotine and copper increased control by 25 per cent. and gave satisfactory protection. In the insectary, oviposition by the grape cane girdler [*Ampeloglypter ater*, Lec.] in potted grape vines occurred from 2nd June until 14th July, chiefly towards the beginning of the period. The numbers of eggs per female averaged 10·5, and the developmental period from

egg to adult 47·5 days. A spray containing cryolite and Fermate [ferric dimethyldithiocarbamate] gave better protection to the vines than lead arsenate and Bordeaux mixture or wettable derris powder.

A severe outbreak of the European corn borer [*Pyrausta nubilalis*, Hb.] developed on maize and other plants throughout almost all the north-eastern United States in 1943. In the middle Connecticut Valley, the moths were emerging by 24th May and larvae were present by 10th June. Insecticides were applied on 11th, 16th, 21st, 25th and 30th June in experimental plots of maize, and pre-harvest examination of these showed that the percentages of plants free from infestation were 85 for a derris spray, 89 for a fixed-nicotine dust, 55 for fixed-nicotine sprays, and 15 for unsprayed plants. Subsequent counts showed that the corresponding average borer populations per plant were $1\frac{1}{2}$, 2, $2\frac{1}{2}$ and $5\frac{1}{2}$. The percentages of the harvested ears free from infestation were 91 and 95 for the plots sprayed with derris and dusted with fixed nicotine, 90 and 89 for plots sprayed with fixed nicotine at concentrations of 3 and 2 lb. per 100 U.S. gals. and 64 for untreated plots ; in late pickings, the contrast between treated and untreated plots was greater.

Potatoes were planted in experimental plots on 7th May and remained green until the first killing frost on 5th and 6th October ; they were harvested on 13th October. Potato flea-beetles [*Epitrix cucumeris*, Harr.] appeared as soon as the plants were above ground and were abundant until mid-August, but leafhoppers [*Empoasca fabae*, Harr.] were comparatively rare. Stalk infestation by *P. nubilalis* was heavy during late June and early July, but injured growth was soon replaced ; there was little or no evidence of injury in late summer by the second generation. Infestation by potato Aphids was severe after a period of hot dry weather in early July, but they were controlled by the inclusion of nicotine in the sprays of 20th and 28th July, when the weather was hot and sunny. Bordeaux mixture was applied ten times at approximately weekly intervals from 15th July to 3rd September. The average numbers of punctures per square inch of leaf surface due to feeding by *Epitrix* were 28 and 35 per cent. greater in plots receiving Bordeaux mixture at strengths of 8 : 4 : 100 and 4 : 4 : 100, respectively, than in one in which it was used at 8 : 8 : 100, and the addition of calcium arsenate to the three mixtures reduced the numbers by $32\frac{1}{2}$, $35\frac{1}{3}$ and $16\frac{1}{2}$ per cent., respectively, so that the averages were about equal. In general, increased yields were obtained when calcium arsenate was added to the Bordeaux mixture.

Infestation of set onions by the onion thrips [*Thrips tabaci*, Lind.] was comparatively light in the Connecticut Valley in 1943, but migration in the second half of July, followed by hot dry weather in early August, resulted in a rapid increase in population on seed onions, and infestation remained severe until the second half of August. A heavy application of a summer dinitro dust reduced the population by 91 per cent., but scorched the plants slightly ; a summer dinitro spray reduced it by 92 per cent., but had little residual effect. The standard spray of nicotine sulphate and soap gave 90·2 per cent. reduction, and one of derris and a spreader gave 87 per cent., with pronounced residual action. Preliminary tests of an insecticide based on extractives of the castor bean [*Ricinus communis*] with ricine as the basic constituent showed that it had excellent wetting and spreading qualities, even on plants with a waxy surface, such as onions [*cf.* **32** 253], and gave fairly good control of *T. tabaci*, killing all the thrips that were actually hit by the spray. It showed promise as a contact spray against Aphids, and did not injure the foliage of various garden and ornamental plants. There was little evidence of feeding by the Mexican bean beetle [*Epilachna varivestis*, Muls.] after it was applied to beans.

Lygus campestris, L., continued to be destructive to celery [*cf.* **32** 253] in one area in 1943, causing losses of up to 50 per cent. of the early crop and 10–25 per cent. of the late crop. Severe heart-rot and dwarfing of the plant

was connected with injury by the Capsid in cages, where celery confined with two examples per plant was severely injured. The winter is passed in the adult stage, and there are two generations during the summer; most of the first-generation nymphs had hatched by 26th June. Nymphal development lasted about 35 days in June–July, and complete development, including an egg stage of 9–13 days, lasted 39–43 days at a mean daily temperature of 66–67°F. and 48–50 days at 61–62°F. in late August and September. A dust of nicotine and pyrethrum was the most effective treatment against both generations. A spray of Black-Leaf 155 [14 per cent. fixed nicotine] and Bordeaux mixture and a dust of Black Leaf 155 and lime were also of value against the first generation, and sprays of nicotine sulphate (1 : 800) or commercial pyrethrum, both with the addition of 2 lb. soap flakes per 100 U.S. gals., against the second. Treatment was 5–10 per cent. more effective with a spray gun that drove the spray into the heart of the celery than with a mist nozzle. Applications at intervals of two and three weeks reduced the number of bugs found 24 hours after treatment as much as weekly ones, but permitted greater reinfestation in proportion to the interval between treatments.

Significant differences in the life-cycle of the common red spider mite [*Tetranychus*], on different plants in the greenhouse were not consistently correlated with the pH of the plant sap as in previous studies [*cf.* **32** 253], indicating that other factors may be involved; about twice as many eggs were laid on beans as on the other plants tested. On roses, four applications of nicotine sulphate (1 : 400), with or without soap, did not give satisfactory control; a commercial thiocyanate spray gave good control, but caused severe foliage injury even when diluted at the rate of 1 : 1,200. In further tests on rose, a commercial mixture containing 20 per cent. dicyclohexylamine dinitrocyclohexylphenolate gave good control when applied three times at the rate of ½ or 1 oz. per 100 U.S. gals. water and excellent control when applied 1–3 times at the rate of 2, 3 or 4 oz. The spray containing 4 oz. in 100 U.S. gals. water applied the critical dosage, and almost perfect control was obtained whether this amount of poison was applied in one or in several applications. The mortality was about 30 per cent. greater on carnation than on rose when less than the critical dosage was used, but about the same when 4 oz. per 100 U.S. gals. or more was applied. The spray caused no foliage injury on rose or carnation when applied alone, but injured rose and chrysanthemum leaves when combined with a neutral (26 per cent. metallic) copper fungicide (1 : 50), particularly during hot weather in midsummer.

The results are given of investigations on the control in individual elm logs of the Scolytid vectors of the fungus [*Ceratostomella ulmi*] that causes Dutch elm disease. On 14th May, five days before adults of *Hylastes* (*Hylurgopinus*) *rufipes*, Eichh., began to make their first egg galleries in the vicinity, dry unseasoned elm logs were sprayed with a mixture of orthodichlorbenzene and fuel oil (1 : 8 by volume) at the rate of 240 cc. per sq. ft. of bark, the crevices being well saturated and each log turned over during the application so that all the bark could be reached, and then exposed to infestation in the shade, together with untreated logs. The treatment reduced the number of brood galleries that became established by 99·5 per cent., the number of progeny that emerged during the season by 100 per cent., and the combined number of progeny that emerged and that were still present in November by 98·5 per cent.; *H. rufipes* was the only Scolytid that attacked the logs. When unseasoned logs were similarly treated with a mixture of creosote and kerosene (1 : 4 by volume) strained to remove the precipitate and applied at the rate of 160 cc. per sq. ft. on 20th May, complete protection was obtained throughout the season, and when this spray was applied to parts of other logs that were also piled in the shade, only the untreated portions became infested by *H. rufipes*. *Eutetrapha* (*Saperda*) *tridentata*, Ol., was abundant in untreated logs, but was apparently repelled by both the spray mixtures. During July 1942,

elm logs in which the brood galleries of both *H. rufipes* and *S[colytus] multistriatus*, Marsh., contained only immature progeny were sprayed with the first mixture at the rate of 52·5 cc. per sq. ft. of bark and piled in partial shade. On the basis of the number of surviving progeny (immature and emerged) per brood gallery in the following spring in sprayed and unsprayed logs, the treatment caused 79 per cent. mortality, a reduction considered inadequate in the case of vectors of *C. ulmi*. Many examples of *E. tridentata* and some of a species of *Magdalis* survived the treatment. Spraying the logs with the second mixture at the rate of 12·2 cc. per sq. ft. was ineffective. When freshly cut elm logs lying in a north–south direction and exposed to the sun were rolled over every week or every fortnight during the early-season oviposition period of *H. rufipes* (which lasted from 19th May to 2nd July in 1943), many egg galleries were begun on the lower halves, but development stopped in almost all cases when the logs were turned over [*cf.* **32** 254]. Relatively few galleries reached the stage where eggs were laid in them, and most of the larvae that hatched died when very small. The lower but not the upper half of one large log that was left unturned in the sun from May to November was infested. Logs turned once a week were practically free from infestation as compared with logs piled in the shade, and the control was almost as good in logs turned once a fortnight. In November, none of the logs seemed to be in a condition suitable for further attack in the following spring. This treatment and spraying before egg galleries are begun are both considered possible methods of preventing an increase in the local beetle population, and it is suggested that laying the logs in the sun and spraying the lower half might save much time and spray material. A test is described in which good spray coverage was obtained on piled elm logs of cordwood length by using a six-opening spray gun and a power sprayer giving 400 lb. pressure and directing the spray into the interior from the ends of the logs and from the top of the pile, and it is pointed out that satisfactory coverage on logs inside a pile may facilitate treatment to repel or kill Scolytids.

In a comparison of the effects of dusts on honey bees, rotenone and pyrethrum were the most toxic, and nicotine and sulphur progressively less so. D–4 caused only a slight increase over normal mortality, but DN–111 in sugar solution caused complete mortality in five days. In tests of the effect on [apple] trees of sprays containing creosote or phenol, which have been suggested as bee repellents, all dilutions of creosote caused blossom injury [*cf.* **32** 254], but the sprays applied shortly after full bloom did not materially reduce the set of fruit.

WILFORD (B. H.). **Chemical Impregnation of Trees and Poles for Wood Preservation.**—*Circ. U.S. Dep. Agric.* no. 717, 30 pp., 6 figs., 26 refs. Washington, D.C., 1944.

The following is based partly on the author's summary. The results are given of investigations carried out at various seasons of the year from 1930 to 1940 in North and South Carolina on methods of impregnating trees and poles by the sap stream in order to render them resistant to attack by insects and fungi, in the course of which 58 chemicals and mixtures of chemicals and 1,639 trees and 188 poles were used. Some of the methods tested proved to be practical and a few of the chemicals were effective, and it was shown that the durability of fence posts, poles and materials for rustic construction can be increased with little added expense and labour.

Stepping, in which a freshly cut tree or pole is kept upright with the butt end in a container of preservative solution until the chemical is absorbed [*cf.* *R.A.E.*, A **28** 336], and capping, in which the butt of the tree or one end of the pole is encased in a cap-container that holds the solution in direct contact with the wood until it is absorbed, are simple methods. Stepping is practicable

for trees up to 6 ins. in diameter, and capping for those up to 8 ins. in. diameter. Large stepped or capped trees produce one good 10-ft. pole each. The collar and banding methods [*cf.* **28** 336, 337] are used to treat standing trees and are both applicable to trees over 5 ins. in diameter, and particularly to those eight or more inches in diameter. They require more materials and labour and are more complicated than stepping or capping. For the collar method, a 10-in. band of bark is stripped from near the base of the trunk and a groove about ½ in. deep, almost encircling the tree but leaving about an inch between the two ends, is cut round the middle of it ; the preservative solution is poured into a collar of waterproof material, such as rubber, fastened round the tree at the groove. For the banding method, a spiral groove ½ in. deep is made near the centre of a 10-in. barked spiral zone close to the base of the tree, the ends of the groove overlapping for about an inch ; a hole a ¼ in. in diameter is bored through the wood from one end of the groove, opening on the surface of the bole 2–3 ins. away, and one end of a section of ¼-in. rubber tubing is run through it ; a piece of rubber banding material is stapled tightly over the spiral groove so that, when in place, the band is stretched to about 50 per cent. more than its original length ; and a container for the preservative is fastened to the tree above the band and the loose end of the rubber tube is connected with it. Other methods that have been tested [*cf.* **28** 339] are described, but they have only limited and specialised uses. Some of them may be of value should a chemical be found that will repel or control insects when used in quantities not toxic to the tree itself.

Several chemicals, injected into the sap stream at various dosages in ½ U.S. gal. water per cubic foot of wood gave promising results. Both ¾ lb. copper sulphate and 1 lb. zinc chloride proved satisfactory, and their presence in the wood is readily detected. Unlike copper sulphate, zinc chloride does not discolour wood and is only slightly corrosive to iron. A mixture of zinc chloride and sodium dichromate (81·5 : 18·5), known as chromated zinc chloride, at a dosage of ¾ lb. is recommended ; it has the properties of zinc chloride and is possibly more resistant to leaching. Sodium arsenite at a dosage of ½ lb. is fairly effective, but less satisfactory than copper sulphate or zinc chloride ; its properties are similar to those of zinc chloride, but it is very poisonous. Mercuric chloride, though an excellent wood preservative, is unsatisfactory when applied by the sap stream, even at injection dosages of 1½ lb. per cu. ft. of wood, because it does not become well distributed ; it is very poisonous and relatively expensive. Ammonium bifluoride appeared promising and preferable to ammonium fluoride ; its properties are similar to those of zinc chloride, but it seems to permit the wood to dry out more quickly than most of the other salts used. It has the disadvantage, however, that it may break down into poisonous compounds. A solution prepared by dissolving copper chloride and arsenic acid in water (1 : 8 : 15) gave promising results when injected into pines at the rate of 0·8 and 1·6 lb. copper chloride per cubic foot of wood. Copper arsenate and hydrochloric acid are formed, and after the solution is absorbed by the wood, the acid evaporates and leaves an insoluble residue of copper arsenate, which possesses most of the advantages of other satisfactory chemicals and also permits the wood to dry out in a way that is comparable with the drying of untreated wood. Other promising compounds are zinc metarsenite and ammonium copper arsenite.

Absorption of the chemical solutions by pines and yellow poplar (*Liriodendron tulipifera*) normally takes 2–6 hours, but optimum distribution of the chemical within the trees takes nearly two weeks. The impregnated woods tend to season with only minor cracking. Chemical distribution in large trees by sap-stream methods is limited to the active sapwood, but the heartwood and the transition wood in most pines are relatively more durable than those in most hardwoods, and of the trees containing heartwood, therefore, the former may be more effectively protected than the latter. Treatment was generally

more satisfactory when made in late spring and summer than at other seasons [*cf.* **28** 336].

LITTLE jr. (E. L.). **Common Insects on Pinyon** (*Pinus edulis*).—*J.N.Y. ent. Soc.* **51** no. 4 pp. 239–252, 6 refs. Lancaster, Pa., 1943.

The following is based on the author's summary of this paper, which contains records of numerous insects observed on *Pinus edulis*, in Arizona and New Mexico in 1937–41, with notes on the habits and importance of some of them. The more injurious of the insects that feed on the foliage are *Matsucoccus acalyptus*, Herbert [*cf. R.A.E.*, A **32** 151] and *Chionaspis pinifoliae*, Fitch, which occasionally kill some trees, while outbreaks of bark-beetles, chiefly *Ips lecontei*, Swaine, and related species, sometimes cause widespread mortality but last only a year or two. The most important economic damage is that to the cones and seeds, since the edible seeds (pinyon nuts) are the most valuable product of the trees. Many first-year cones are killed by various unidentified Cecidomyiids, while second-year cones and seeds are attacked by larvae of *Eucosma* (?) *bobana*, Kearfott, *Conotrachelus* sp. and two species of *Dioryctria* and by adults of *Conophthorus edulis*, Hopk. These insects together almost completely destroy a light crop of cones. No method of control is known. Account should be taken of insect damage in forecasting a crop.

FROST (S. W.). **Three new Species of Diptera related to** *Agromyza pusilla* **Meig.**—*J.N.Y. ent. Soc.* **51** no. 4 pp. 253–260, 2 pls., 6 refs. Lancaster, Pa., 1943.

The author states that several species of *Agromyza* that mine the leaves of economic plants have in the past been confused with *A. pusilla*, Mg., which forms blotch-like and not serpentine mines, and from an examination of European material determined by Hering and numerous specimens reared in the United States, he gives a key to the North American species of the complex, redescribes *A. pusilla*, which infests clover, beet, *Asclepias* and *Lactuca* in the United States, and describes three new species from that country. These are *A. subpusilla*, which is widespread and makes linear mines in crucifers, *Eupatorium*, *Asclepias*, aster, nasturtium (*Tropaeolum*), *Plantago* and fern, *A. phaseolunata*, which forms blotch-like mines in lima beans in New Jersey and apparently caused considerable damage in 1942, and *A. allia*, which makes short linear mines in onion and occurs in Iowa, Kansas, Michigan and Missouri. *A. orbona*, Mg., which has frequently been confused with *A. flaveola*, Fall., has repeatedly been reared from the leaves of pea in California. A note on the genitalia of Agromyzids is appended.

CALLAN (E. McC.). **Cacao Stink-bugs (Hem., Pentatomidae) in Trinidad, B.W.I.**—*Rev. Ent.* **15** fasc. 3 pp. 321–324, 5 refs. Rio de Janeiro, 1944.

A list is given of seven Pentatomids, including five species of *Mecistorhinus*, that occur on cacao in Trinidad. They have similar habits, and the majority are rare [*cf. R.A.E.*, A **33** 147]. The females of six of the species were observed to remain near their eggs and the young nymphs, apparently in order to protect them, but in spite of this, parasites have been bred from the eggs of three of them.

DE OLIVEIRA (S. J.). **O dicloro-difenil-tricloroetana (DDT) no combate às brocas de livros :** *Dorcatoma bibliophagum* **e** *Catorama herbarium* **(Coleoptera, Anobiidae)—1a. nota.** [DDT in the Control of the Book Borers, *D. bibliophagum* and *C. herbarium*. First Note.]—*Rev. Ent.* **15** fasc. 3 pp. 325–328. Rio de Janeiro, 1944.

Experiments with DDT against *Dorcatoma bibliophagum*, Magalh., and *Catorama herbarium*, Gorh., which are injurious to books in Rio de Janeiro,

were carried out in 1944 by confining larvae or adults of *Dorcatoma* and a very few of *Catorama* on pieces of paper that had been painted several days before with a 1 per cent. solution in alcohol or a 1, 3 or 5 per cent. solution in kerosene. Examinations were made at intervals of a few days. It was observed that the larvae of both species were protected from an immediate contact action of DDT by their hairs, but that their mouthparts were paralysed as soon as they began to feed. The adults were killed while moving over the paper. All the insects were dead at the final examination, but one larva of *Dorcatoma* on paper treated with the 5 per cent. solution gave rise to an adult. There was little or no mortality in the controls, and, in subsidiary tests, there was no advantage in adding sassafras oil to the solutions of DDT as a repellent.

López Cristóbal (U.). **Dipteros útiles.** [Useful Diptera.]—15 pp. La Plata, Univ. nac., Fac. Agron., 1944.

In these class notes, the author briefly discusses the morphology, metamorphosis and classification of Diptera and reviews the habits of the various families, giving examples, chiefly from the fauna of Argentina, and drawing attention to forms that are in any way useful to man. Most of the latter are parasitic or predacious on insect pests.

Smee (C.). **Bagworms in Tea.**—*Nyasaland agric. quart. J.* **5** no. 1 pp. 1–5, 4 figs. Blantyre, 1945.

In 1939, Psychids (bagworms) did not appear likely to be of importance as pests of tea in Nyasaland [*cf. R.A.E.*, A **29** 60], but outbreaks have occurred in both Mlanje and Cholo during the past 3–4 years. They were confined to a few acres in each case, but the population was very large on one occasion ; infestation was not usually noticed until about October, when pruning had started. Four types of bagworm shelter that have been found on tea and the damage caused by the larvae are described and illustrated. Although they feed mainly on foliage, the larvae also devour the bark from young shoots and may damage tea bushes in this way, particularly after pruning, when little other feeding is possible. It is suggested that a quick search of each area should be made as pruning is begun in order to decide whether it is desirable to remove and burn the prunings or collect the bagworms by hand ; the application of an insecticide would be uneconomical.

Kelsey (J. M.). **A Trap for collecting Adults of ground-pupating Insects.**—*N. Z. J. Sci. Tech.* **26** (A) no. 5 pp. 294–297, 3 figs. Wellington, N.Z., 1945.

A description is given of an apparatus that has been used in New Zealand to collect adults of *Antholcus varinervis*, Spin. [*cf. R.A.E.*, A **32** 78], *Eucolaspis brunnea*, F., and *Odontria zealandica*, White, as they emerge from the soil. It is believed that it will prove equally successful in the case of other insects that pupate in the ground provided that the adults are negatively geotropic. It consists of a container for the soil in which the larvae have pupated or alternatively a frame that can be sunk into the ground, with wires, up which the emerging adults climb, arising from each corner and converging in the centre to form a loop over which is supported a trap of celluloid and muslin with a muslin entrance in the shape of a truncated cone. When the apparatus is used in the open, grass should be closely clipped.

Hinton (H. E.). **The Species of *Anthrenus* that have been found in Britain, with a Description of a recently introduced Species (Coleoptera, Dermestidae).**—*Entomologist* **78** no. 980 pp. 6–9, 6 figs. London, 1945.

Of the seven species of *Anthrenus* that have been found in Britain, *A. verbasci*, L., *A. museorum*, L., and *A. fuscus*, Ol., are common and widely distributed,

while *A. pimpinellae*, F., and *A. scrophulariae*, L., occur occasionally, particularly in collections of dried insects. *A. scrophulariae* was recently observed in one such collection in London. Larvae of *A. vorax*, Waterh., were found in Britain in 1916 in an officer's kit from Burma, in 1943 in clothes sent from the Middle East, and in 1944 on imported wool in a store in Yorkshire and on Indian myrobalans [*Terminalia*] imported into Glasgow. A single larva of *A. coloratus*, Rttr., the adults of which are described and which has been bred from caraway seed and an uncured antelope head in the Sudan and recorded in the Museum compound at Calcutta and on flowers of chestnut in the north-western Himalayas, also occurred on the myrobalans. It has not previously been recorded from Britain. A key to the adults of the seven species is included.

MASSEE (A. M.). *Laemostenus terricola* **L. (Col., Carabidae) feeding on stored Apples.**—*Ent. mon. Mag.* **81** no. 968 p. 9. London, 1945.

Damage to dessert apples of two varieties in store in a cellar in Kent in October 1944 was found to be due to feeding by adults of the Carabid, *Pristonychus* (*Laemostenus*) *terricola*, Hbst., which is locally common in various outdoor situations. Cooking apples were not injured. In captivity, the beetles fed readily on apples, but only at night.

TEN HOUTEN (J. G.). **Iets over de bestrijding van de bessenbladwesp** (*Pteronus ribesii* **Scop.**). [A Note on the Control of *Nematus ribesii*.]—*Tijdschr. PlZiekt.* **46** no. 4 pp. 146–150, 5 refs. Wageningen, 1940.

Nematus (*Pteronus*) *ribesii*, Scop., is usually controlled on gooseberry in Holland by sprays of lead arsenate, but since there is some risk, especially in dry years, of harmful residues on the fruit, experiments were carried out to compare the effectiveness of a derris spray containing 0·01 per cent. rotenone with that of a spray of lead arsenate (0·3 per cent.) and lime, both with a spreader. In a small-scale field test, many dead larvae were observed beneath the bushes nine days after application of either spray and there was no evidence on the bushes of a new generation of larvae, which, however, were numerous on the untreated controls. A derris dust (0·5 per cent. rotenone) gave similar results. In laboratory tests, in which larvae were sprayed or dusted on the leaves, the derris spray gave complete mortality in one day and the dust in five, while lead arsenate gave high but not complete mortality by the end of that period. It is considered likely that a still lower concentration of derris would prove effective.

KJELLANDER (E.). *Carpodiplosis papaveris* **n. gen. n. sp., ein neuer Schädling des Oelmohnes (Dipt. Cecid.).** [*C. papaveris*, gen. et sp. n., a new Pest of Poppy.]—*Opusc. ent.* **10** pt. 1–2 pp. 38–43, 3 figs. Lund, 1945.

Descriptions are given of the larva, pupa and adults of both sexes of *Carpodiplosis papaveris*, gen. et sp. n., a Cecidomyiid that was observed in the summer of 1944 on the seed capsules of poppy (*Papaver somniferum*) in southern Sweden. The larvae develop between the outer wall of the capsule and the petals and cause the petals to adhere to the capsule, but do not form a gall. Numerous larvae occurred beneath a single petal, the capsules sometimes became deformed and the development of the seeds was hindered. Infested capsules were frequently attacked by fungi, which caused them to dry out completely. Full-fed larvae brought into the laboratory on 23rd July spun light cocoons in sand, and adult emergence began on 18th August and reached a peak between 27th August and 9th September. The pupal stage lasted about a week. Since the majority had not pupated by 26th September, however, it is

concluded that the larvae normally overwinter in the cocoons and do not pupate until spring.

WIGGLESWORTH (V. B.). **Transpiration through the Cuticle of Insects.**—*J. exp. Biol.* **21** no. 3–4 pp. 97–114, 2 pls., 6 figs., 42 refs. London, 1945.

Some of the results given in this report of investigations on the mechanism that limits the evaporation of water through the cuticle of insects and the extent to which its action can be disorganised by inert dusts or other agents have been noticed from a much less detailed source [*R.A.E.*, A **33** 188]. Experiments on representative insects of diverse groups confirmed the view that evaporation is checked by a very thin layer of wax on the outer surface of the epicuticle. The effectiveness of this layer, which in some insects is covered by a thin layer of cement varying in hardness and resistance to removal in different species and in different parts of the same insect appears to depend on the orientation and close packing of the long wax molecules of which it is composed [*cf.* next abstract]. In *Blatta* [*orientalis*, L.], however, the waterproof layer is a soft grease that is freely exposed on the surface and was largely removed by adsorption when the insects were sprinkled or rubbed with alumina [aluminium oxide]. When the rate of evaporation from dead insects in which the spiracles were sealed was measured at different temperatures, the permeability of the wax layer was found to increase abruptly at a certain critical temperature that varied widely in different species and in different stages of the same species. There was a tendency for the critical temperature to be about the same in insects exposed to the same degree of humidity in their natural environments, and it was highest in species and stages that are most resistant to desiccation. In the case of insect larvae from soil, the rate of evaporation was high, even at low temperatures, and this was shown, by immersing wireworms in a silver solution [**33** 188], to be the result of the abrasion of the wax layer by the soil particles. The cuticle of wireworms that moulted and were then kept for a further two weeks without access to soil was found to be impermeable. In the newly formed puparium of *Calliphora erythrocephala*, Mg., the impermeable layer of wax is wholly superficial, but after pupation the main impermeable layer is on the surface of the pupa itself, and the critical temperature is then much higher.

If the wax layer of a living insect is abraded by means of inert dusts or in other ways, wax is secreted throughout the substance of the cuticle to restore its impermeability. The epicuticle shows no visible injury following abrasion [**33** 189], but the behaviour of the underlying cells and the growth processes in the epidermis are both affected. Abrasion of the wax layer also increases the intake of liquid water, which is in agreement with observations on the osmotic intake of water by normal, abraded wireworms in the soil [**32** 333].

In an attempt to discover an agent that can break down the protective layer and so render the cuticle permeable, the ability of a large number of wetting agents, detergents and other chemicals to increase evaporation from nymphs of *Rhodnius prolixus*, Stål, was tested, and the results obtained with some 50 of them are shown in a table. In general, oil-soluble substances with hydrophilic properties were the most effective, though some other properties also seem to be involved [see next abstract]. Some materials that differed widely in effectiveness when tested on *Rhodnius* were applied to other insects, as it was thought that these differences might be due to the cement covering the wax as well as to the wax itself. Two cetyl ethers of polyethylene glycol that gave the best results on *Rhodnius* were also the most effective on the other insects, though their superiority was less marked; medicinal paraffin was relatively more effective than on *Rhodnius*. In a small test to determine the effect of detergents on the penetration of the cuticle by insecticides, rotenone or nicotine in a cetyl ether of polyethylene glycol applied to the backs of

nymphs of *Rhodnius* caused their death in 24 hours, but when these insecticides were applied in medicinal paraffin, the rotenone produced no effect in seven days and the nicotine very little in two.

BEAMENT (J. W. L.). **The cuticular Lipoids of Insects.**—*J. exp. Biol.* **21** no. 3–4 pp. 115–131, 7 figs., 31 refs. London, 1945.

The following is substantially the author's summary. The passage of water through isolated insect cuticles and exuviae, both before and after extraction with lipoid solvents, was measured. The impermeability of the cuticle is due to a thin continuous layer of lipoid over the epicuticular surface. Transmission of water through unextracted cuticle is more rapid from the epicuticle towards the endocuticle than in the reverse direction, particularly in the exuviae. The lipoid layer is approximately 0·25μ thick on most of the insects investigated and is independent of cuticular thickness. The thickness of wax on a given species is very constant. The pure extracted lipoids are solid waxes, except in Blattids, which have a mobile grease. The waxes show a gradation of physical properties corresponding to their melting-points. The hardest are the most hydrofuge and are found on the most impermeable insects. The impermeability of insect wax films deposited on a membrane depends on the degree of chemical orientation induced in the lowest layer of molecules by the membrane surface. The monolayer at the epicuticular interface of the insect is completely orientated and tightly packed, and is the main barrier to the passage of water.

Waxed membranes show a sudden increase in permeability at a critical temperature corresponding to that of the insect from which the wax was obtained [*cf.* preceding abstract]. The waxes undergo a crystalline transition at this temperature; their molecules become mobile, and the orientated layer is disorganised. In the presence of water, wax surfaces become more hydrophilic at the transition points, and the molecules are permanently orientated in this state. Boiling solvents are needed to extract waxes from the exuviae; the extracts are all soluble in cold chloroform. The vapours of wax solvents will destroy the orientation of the wax on the cuticle. Substances having both hydrophilic and hydrophobic properties are present in waxes with high melting points; they may be residues of natural emulsifiers.

Inert dusts increase evaporation through waxed membranes by adsorbing the lipoid only if the membrane exerts little orientation force. They cannot overcome the orientational bonds of a wax layer deposited on a membrane of insect epicuticle unless adsorption is augmented by abrasion. Dusts will adsorb all but the lowest orientated layer of the grease on *Blatta orientalis*, L.

Some analysis is given of the mode of action of emulsifiers and detergents, which increase the permeability of waxed membranes and of the insect cuticle. Their efficiency depends on their own permeability to water and possibly on their ability to penetrate the cement layer on the insect as well as on their capacity for emulsifying wax.

GUNN (D. L.) & KNIGHT (R. H.). **The Biology and Behaviour of *Ptinus tectus* Boie. (Coleoptera, Ptinidae), a Pest of stored Products. VI. Culture Conditions.**—*J. exp. Biol.* **21** no. 3–4 pp. 132–143, 8 figs., 19 refs. London, 1945.

Since *Ptinus tectus*, Boield., is a common pest in warehouses in Britain and is easily bred in large numbers in the laboratory, it is a convenient insect to use for the biological assay of insecticides. A breeding technique that would give uniform testing material was desired, and the investigations carried out to this end are described in this paper, which is one of a series [*cf. R.A.E.*,

32 316, etc.]. The following is based on the authors' summary. The highest temperature [*cf.* **31** 27] at which *P. tectus* should be bred is near 24·7°C. [76·46°F.]. Humidities higher than 70 per cent. favour the growth of moulds, and lower humidities prolong development. The best food tested was 95 per cent. whole ground wheat with 5 per cent. dried brewers' yeast, and the smallest quantity that permitted complete development in isolation was about 3 mg. per insect. This produced adults of one-third of the normal weight in almost normal time. About 30 mg. was necessary to produce full-sized adults. When up to 32 larvae were reared together, development was prolonged by up to 40 per cent., with 20 per cent. diminution in size. With groups of 8 larvae, as much as 5 gm. food per larva was required before this group effect disappeared. With quantities of food that were optimal or excessive for isolated larvae, the group effect reached its maximum with 8 larvae in the group. Individuals reared in groups showed a wider range of variation in size than those reared in isolation; but the duration of development was not more variable. No adequate explanation was found for the group effect, and it was not possible to produce from mass cultures insects as uniform in size as those reared singly. Maximum oviposition occurred about a week after adult emergence, and the number of eggs laid decreased if fresh food and water were not available daily. One female survived for 376 days and laid 960 eggs. In establishing mass cultures, a large number of insects in good condition should be allowed to oviposit for a day or so, since no better result will be obtained by leaving them longer.

Smee (C.). **Report of the Entomologist, 1944.**—5 pp. typescript. [Zomba, Dep. Agric.] Nyasaland [1945].

There were no unusual outbreaks of insect pests on cotton in Nyasaland during 1944, with the exception of a rather heavy infestation by *Diparopsis castanea*, Hmps., in the Lower River district. Observations, mostly in the Northern Province, confirmed the relationship between the tobacco Aphid, *Myzus persicae*, Sulz., and the weed, *Gynandropsis pentaphylla* in the dry season [*cf. R.A.E.*, A **33** 85]. No Aphids were observed during the dry season on tobacco plants that had not been uprooted, but they were heavily attacked by distortion viruses. *Gnorimoschema* (*Phthorimaea*) *heliopa*, Lower, increased on these plants until October, when they were destroyed, and a species of *Brachymeria* and a Braconid tentatively determined as *Apanteles singaporensis*, Szépl., were reared from the larvae. *G. heliopa* was prevalent in November on native snuff tobacco (? *Nicotiana rustica*) in South Nyasa, where a species of *Brachymeria* and a Braconid closely allied to *Chelonus* (*Chelonella*) *rufoscapus*, Cam., were bred from it. *Lasioderma serricorne*, F., was injurious to imported and locally manufactured cigarettes in retail stores, where the infestation was chiefly due to the retention of large stocks over long periods and inadequate packing. When 53 males and females were enclosed in a jar with a package of 50 locally manufactured cigarettes, 827 larvae, pupae and adults were obtained after 10 weeks. The Pteromalid, *Aplastomorpha calandrae*, How., is a common parasite of *L. serricorne* in tobacco stores, and larvae of *Tenebroides mauritanicus*, L., are probably predacious on it. The infestation was gradually controlled by spraying bulk stores of unmanufactured tobacco with pyrethrum in oil. In November, the importation of dahlia plants and tubers from registered nurseries in Southern Rhodesia was again permitted, as it was reported that the kromnek virus [*Lethum australiense* var. *typicum* of Holmes] had been eliminated from them [*cf.* **33** 85].

Bagworms, especially *Acanthopsyche* sp., were particularly noticeable on tea in parts of the Cholo area in October [*cf.* **34** 58]. *Howardia biclavis*, Comst., which had previously been recorded from tung (*Aleurites*), was also recorded on tea in this district; attention was first attracted to it because it was infested

by an entomogenous fungus of the genus *Septobasidium*. Adults of the Bostrychid, *Apate indistincta*, Murr., occasionally bored into the main stems of *Aleurites* during the dry season, but were killed by exudation of resin, which blocks the entrance holes of their tunnels. Small outbreaks of *Icerya purchasi*, Mask., and *Pulvinaria jacksoni*, Newst., occurred in February and in April and June, respectively, on *Aleurites fordi*, which appears to be more susceptible to attack by Coccids than *A. montana*. A severe infestation by *Clavaspis herculeana*, Doane & Hadden, occurred on *A. fordi* in a small garden in which the trees were closely planted and conditions exceptionally hot. It was heavily attacked by a fungus, tentatively determined as *Myriangium* sp. When the trees were examined in November, after some rain had fallen, the only sign of damage was the presence of dead lateral branches, and the trees were bearing a fair crop. Coccids of the *Aspidiotus* group on *Aleurites* are parasitised by *Aspidiotiphagus lounsburyi*, Berl. & Paoli, and *Habrolepis* sp.; a single male of *Perissopterus buscki*, How., was also reared from them. *Pseudococcus perniciosus*, Newst. & Willc., and *P. adonidum*, L., were not abundant on *Aleurites*; several Chalcidoids, not specifically identified, are added to the list of parasites previously recorded from them [**33** 86]. Seedlings of *Cinchona calisaya* var. *ledgeriana* were damaged in September by nymphs of *Helopeltis bergrothi* vars. *disciger*, Popp., and *rubrinervis*, Popp., but in general recovered after control measures had been applied.

An outbreak of *Laphygma exempta*, Wlk., occurred in the Southern Province in March and April for the third year in succession [*cf.* **32** 222] and caused some damage to wheat and other cereals. Infestation began on grasses, but the only one attacked at Zomba was *Cynodon plectostachyum*, the only species of its genus present. The outbreak there was checked by parasites, the young larvae being much reduced by *Euplectrus laphygmae*, Ferrière, in March and early April and the survivors overwhelmed by *Apanteles transvaalensis*, Cam., later in April; the latter was itself heavily parasitised at the end of April by *Pleurotropis nigripes*, Wtstn., and a species of *Eurytoma* closely allied to *E. syleptae*, Ferrière. A severe outbreak of *Trioza* (*Spanioza*) *erytreae*, Del G., occurred on *Citrus* throughout the Protectorate; large numbers of *Encyrtus* sp. were associated with it from June onwards. A few individuals of *Pseudaonidia trilobitiformis*, Green, which is fairly common on wild fig, occurred on the leaves of lemon. Thysanoptera found in flowers of *Chrysanthemum cinerariaefolium* comprised many examples of *Frankliniella dampfi*, Priesner, and *Haplothrips* sp., a few of *Thrips flavus*, Schr., and very small numbers of *T. tabaci*, Lind. A heavy attack by *Plutella maculipennis*, Curt., developed during the dry season on cabbage and cauliflowers in a garden in which crop rotation had not been practised; *Eulimneria* sp., with a hyperparasite, *Aplastomorpha* sp., were reared from it. The Halticid, *Aphthona bimaculata*, Jac., was abundant on simsim [*Sesamum*] at Zomba in February and March. *Rhizopertha dominica*, F., was found in wheat flour that had been imported from Northern Rhodesia and may have been milled in Southern Rhodesia; it has not previously been recorded in Nyasaland or in Southern Rhodesia.

Hymenopterous parasites observed during the year included the Braconids, *Platyspathius turneri*, Nixon, and *P. pictipennis*, Vier., which were fairly numerous on a log of *Acacia* infested by *Sinoxylon ruficorne*, Fhs., and Scolytids; *Elasmus masii* var. *natalensis*, Ferrière, which was reared from cocoons of *Apanteles diparopsidis*, Lyle, found on cotton in the Lower River district and adjoining parts of Portuguese East Africa; *Leptomastix bifasciatus*, Comp., and *Chiloneurus carinatus*, Comp., from *Pseudococcus citri*, Risso, on beans, and *Telenomus numitor*, Nixon, from eggs, thought to be those of a Pentatomid, on *Aleurites*.

Nomadacris septemfasciata, Serv., was of little importance during the year; small bands of hoppers were reported from several areas in January–April [*cf.* **33** 87], but only solitary adults were observed subsequently.

KANGAS (E.) & LESKINEN (K.). *Pegohylemyia anthracina* **Czerny (Dipt., Muscidae) als Zapfenschädling an der Fichte. Orientierende Untersuchung.** [*Hylemyia anthracina* as a Pest of Spruce Cones. Preliminary Investigation.] —*Ann. ent. fenn.* **9** no. 3 pp. 195–212, 4 figs., 16 refs. Helsinki, 1943.

In view of Lovászy's record of *Hylemyia* (*Pegohylemyia*) *anthracina*, Czerny, from spruce seeds in southern Finland in 1940 [*cf. R.A.E.*, A **34** 38], observations on the bionomics and importance of this Anthomyiid there were begun in 1942. Larvae observed in the field at the end of June appeared to be only a few days old, so that it is assumed that oviposition occurs about midsummer. Infested cones were taken to the laboratory in the first half of July, when the larvae were apparently full-fed, and suspended above sand, in which the larvae pupated at the end of the month and in early August. The pupae were allowed to overwinter indoors or in the open, packed in various ways. Only two adults emerged; however, one on 26th March and the other on 13th June, and both were females. The larva, pupa and adult female are described, the female for the first time.

Larval development was usually completed in the seeds, but a few individuals entered the axis of the cone. Infested cones were commonest on trees at the edges of woods or clearings, and solitary trees were seldom attacked. The percentage of cones infested was usually well under 50 and was highest on small trees. The percentage of seeds destroyed in four cones that contained no other pests averaged 37·1, and in a fifth, in which *Cydia* (*Laspeyresia*) *strobilella*, L., was also present, it was 44·6. Other cone pests that sometimes accompanied *H. anthracina* were *Dioryctria abietella*, Schiff., *Eupithecia pini*, Retz., *E. bilunulata*, Zett., *C.* (*L.*) *illutana*, H.-S., *Plemeliella abietina*, Seitner, and *Dasyneura* (*Perrisia*) *strobi*, Winn. An undescribed species of *Asyncrita* and another Ichneumonid parasite were reared from *H. anthracina*, and larvae of *Spermatolonchaea inquilina*, Hend., adults of which emerged from infested cones, are thought to have been predacious on it.

PAPERS NOTICED BY TITLE ONLY.

HUKKINEN (Y.). **Blick auf die Erforschung der Thysanopterenfauna Finnlands, besonders ihrer schädlichen Arten.** [A Survey of Research on the Thysanopterous Fauna of Finland, particularly the injurious Species (review of the literature, with list of species).]—*Ann. ent. fenn.* **8** no. 1 pp. 25–45, 5 pp. refs. Helsinki, 1942.

SAALAS (U.). **Eine neue Mottenlaus,** *Aleurodes campanulae* **n. sp. (Hem., Aleurodidae) an** *Campanula*. [A new Aleurodid, *Aleurodes campanulae*, sp. n., on *Campanula* (in Finland).]—*Ann. ent. fenn.* **8** no. 2 pp. 127–134, 5 figs., 8 refs. Helsinki, 1942.

BRIDWELL (J. C.). **A new** *Amblycerus* [*martorelli*, sp. n.] **affecting Seeds of** *Prosopis chilensis* **in Puerto Rico and Hispaniola** [Haiti and Dominican Republic].—*J. Agric. Univ. P. Rico* **27** no. 3 pp. 133–135. Rio Piedras, P.R., 1943.

GAHAN (A. B.). **A new Encyrtid parasitic in the Eggs of Hesperiidae** [*Ooencyrtus prenidis*, sp. n., from eggs of *Panoquina* (*Prenes*) sp. on sugarcane in Porto Rico].—*J. Agric. Univ. P. Rico* **27** no. 3 pp. 137–139. Rio Piedras, P.R., 1943.